Earth Systems
Environmental Engineering

March 16, 2017

Andrew Park
Hazardous Waste Programs Branch
U.S. Environmental Protection Agency Region 2
290 Broadway, 22nd Fl.
New York, NY 10007-1866

Re: Revised Remedial Investigation Work Plan
AOC 10: Truck Loading Rack
Hess Corporation Former Port Reading Complex (HC-PR)
835 West Avenue
Port Reading, Middlesex County, New Jersey
Program Interest No. 006148
NJDEP ISRA Case No. E20130449
EPA ID No. NJD045445483

Dear Andrew:

Enclosed please find the Revised Remedial Investigation Work Plan (disc) for the above-referenced site. Please feel free to contact me at (732) 739-6444 if you have any questions or require additional information.

Sincerely,

Amy Blake
Senior Project Manager

cc:
Mr. Phil Cole, Case Manager (including 3 paper copies) – NJDEP
Mr. John Schenkewitz, Manager, Remediation - Hess Corporation
Ms. Krista Snyder, Manager, Remediation – Buckeye Partners, L.P.
Mr. Rick Ofsanko – Earth Systems
Mr. John Virgie – Earth Systems

REMEDIAL INVESTIGATION WORKPLAN

AOC 10: Truck Loading Rack
Hess Corporation – Former Port Reading Complex
(HC-PR)
750 Cliff Road,
Port Reading, Middlesex County, New Jersey
NJDEP PI# 006148
ISRA Case No. E20130449
EPA ID No. NJD045445483

July 2016
Revised March 2017

Prepared for:

Hess Corporation

Trenton-Mercer Airport
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Prepared By:

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REMEDIAL INVESTIGATION WORKPLAN

AOC 10: Truck Loading Rack
Hess Corporation – Former Port Reading Complex (HC-PR)
750 Cliff Road
Port Reading, Middlesex County, New Jersey
NJDEP PI# 006148

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1.0 INTRODUCTION

On behalf of Hess Corporation (Hess), Earth Systems, Inc. (Earth Systems) has prepared this Remedial Investigation Workplan (RIW) for the environmental area of concern designated as AOC 10: Truck Loading Rack (AOC 10) at the Hess Corporation Former Port Reading Complex (HC-PR), located at 750 Cliff Road, in Port Reading (Woodbridge Township), Middlesex County, New Jersey (the Site). The purpose of the remedial investigation is to delineate the horizontal and vertical extent of impacts to the applicable remediation standard in each environmental medium at the Site.

This RIW has been revised as per comments received from the New Jersey Department of Environmental Protection (NJDEP) on September 27, 2016 and the Environmental Protection Agency (EPA) on August 26, 2016. A copy of the comments and Earth Systems' response is included in **Appendix 1**.

A United States Geological Survey (USGS) 7.5 minute series quadrangle map (Arthur Kill, New Jersey), depicting the HC-PR facility and associated land features is presented as **Figure 1.** The locations of AOC 10 groundwater monitoring wells, temporary monitoring wells, historic spills, and subsurface utilities are presented on **Figure 2**.

Due to historic operations, the Site is jointly regulated by both the NJDEP and the EPA. The NJDEP Industrial Site Recovery Act (ISRA) was triggered when HC-PR executed an agreement to sell the Port Reading Complex. The Site is regulated under EPA's Resource Conservation and Recovery Act (RCRA) since former operations at the Site required the treatment, storage, and disposal of hazardous waste.

In accordance with the New Jersey Technical Requirements for Site Remediation (TRSR) (7:26E-4.1d), this RIW is being submitted for approval since the Site is regulated under RCRA, in addition to being subject to reporting requirements under ISRA. This RIW is an AOC specific plan solely intended to address investigation of AOC 10.

The Truck Loading Rack is currently (and historically) located in the southwestern portion of HC-PR and was used by HC-PR to load fuel trucks with gasoline, heating oil, and diesel fuel. The Truck Loading Rack is also in use by the current owner/operator of the Property as well. There are several known historic releases associated with AOC 10. Currently, there are nine (9) groundwater monitoring wells associated with AOC 10 utilized to monitor impacts in the shallow, intermediate, and deep groundwater zones for several Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs). Light Non-Aqueous Phase Liquid (LNAPL) was originally detected in AOC 10 monitoring wells in 1998. LNAPL recovery has been conducted at AOC 10 utilizing various methods, including vacuum recovery, from impacted monitoring wells. During the most recent groundwater gauging events, LNAPL was not detected in any of the monitoring wells associated with AOC 10.

On November 9, 2012, a Remedial Investigation Report (RIR) was submitted by EnviroTrac Ltd. (EnviroTrac) to the NJDEP detailing AOC 10 historic groundwater investigation activities. According to the 2012 RIR, shallow groundwater had been delineated in AOC 10. EnviroTrac recommended conducting a soil investigation and performing additional groundwater investigation activities to address impacts in the intermediate and deep groundwater zone.

The following RIW provides a summary of historic groundwater investigation activities and impacts associated with AOC 10. Following the summary are recommendations for additional investigation activities to delineate impacts in all effected media associated with AOC 10 in order to satisfy NJDEP requirements in accordance with the TRSR, New Jersey Administrative Code (N.J.A.C.) 7:26E; N.J.A.C 7:26C, *The Administrative Requirements for the Remediation of Contaminated Sites (ARRCS)*; N.J.S.A. 58:10C-1 et seq., *The Site Remediation Reform Act (SRRA)*; and the associated NJDEP SRRA Guidance Documents. All information obtained during the proposed remedial activities will be documented in an RIR for AOC 10.

2.0 BACKGROUND

2.1 Site Description

The HC-PR facility is an approximate 223-acre irregularly shaped parcel, situated in an industrially developed waterfront area. A USGS map of the facility location is presented as **Figure 1**. The HC-PR facility is identified as Block 756, Lot 3; Block 756.01, Lots 1.02, 2, and 3; Block 756.02, Lots 1 and 8; Block 757, Lot 1; Block 760, Lot 6; Block 760.01, Lots 2 and 3; Block 760.02, Lots 1, 2, and 3; Block 1096.01, Lot 6, and Block 664.01, Lots 1.01 and 1.02**.**

The HC-PR facility is located east of Cliff Road and abuts the southern property boundary of the Conrail Port Reading Rail yard. Immediately east-southeast of the facility is the Arthur Kill shipping Channel, and to the southwest is the PSE&G Sewaren Generating facility. The former Port Reading Coal Docks, currently owned by Prologis Corporation, are located to the northeast. Port Reading Avenue is located to the northwest. A mixture of industrial and commercial properties are located to the west. Two (2) residential properties are located up-gradient to the northwest, and an industrial property is located to the south.

The HC-PR facility formerly processed low sulfur gas oils and residuals as feed to a Fluidized Catalytic Cracking Unit (FCCU) that converts gas oil into gasoline, fuel oil, and other hydrocarbon products (e.g. methane, ethane and liquid petroleum gas). The HC-PR site operations were initiated in 1958 with a Crude Topping Unit and underwent various expansions between 1958 and 1970. In 1974, refining operations were suspended and the facility operated only as a bulk storage and distribution terminal until 1985. In April 1985, following a retrofit, the HC-PR facility resumed refining operations. The refinery was demolished in 2015, and currently the Site is operated only as a bulk storage and distribution terminal.

The Truck Loading Rack is currently (and historically) located in the southwestern portion of HC-PR and was used by HC-PR to load fuel trucks with gasoline, heating oil, and diesel fuel. The Truck Loading Rack is also used for fuel loading by the current owner/operator of the Property, Buckeye Partners, L.P. (Buckeye).

2.2 Site Geology and Hydrogeology

The geology of the HC-PR facility was determined from the data collected at the HC-PR facility, during the subsurface investigations, and from the Geologic Map of the State of New Jersey. The HC-PR facility is underlain by the Magothy and Raritan formations, which are the lowest members of the Cretaceous-age Coastal Plain physiographic sediments. The Raritan Formation consists of sands and clays of variable color and grain size, and the overlying Magothy Formation consists of dark lignitic sand and clay containing glauconite near the top. The western section of the HC-PR facility is underlain by a thick clay unit, while marsh deposits underlie the eastern and southeastern section of the HC-PR facility.

The shallow unconfined water table at the HC-PR facility was encountered between approximately 2 and 11 feet below ground surface (bgs). Groundwater flow is predominately southeasterly in the northwest portion of the HC-PR facility and east-southeasterly in the central portion of the HC-PR facility. The HC-PR facility wells located adjacent the Arthur Kill and North Drainage Ditch are affected by tidal influences. Wells located further away from the Arthur Kill are generally unaffected by tidal influence. An average hydraulic gradient of approximately 0.001 feet /per feet was calculated for the Site.

Based upon the soil boring and monitoring wells logs prepared for the Site, AOC 10 is underlain by reddish-brown silty sand, with varying amounts of clay. Underlying this silty sand layer is a gray silty sand layer at approximately 20 feet below grade and a gray clay layer at approximately 40 feet below grade. Highly weathered mudstone is present in the vicinity of AOC 10 at approximately 60 feet below grade.

There are currently nine (9) permitted monitoring wells directly associated with AOC 10. The following table summarizes the construction details of the monitoring wells.

Monitoring Well ID	Date Drilled	Total Depth	Screened Interval
TR-1R	May 2013	15’	1 – 15’
TR-2R	October 2008	20’	1 – 20’
TR-3RR	April 2013	15’	1 – 15’
TR-4R	June 2012	15’	1 – 15’
TR-4D	June 2012	25’	20 – 25’
TR-4DD	May 2013	56’	51 – 56’
TR-5R	October 2010	20’	1 – 20’
TR-6	October 2010	20’	1 – 20’
TR-6D	May 2013	28’	23 – 28’

In addition to the wells listed above, several other Site wells were installed as part of the investigation of other AOCs and these wells can also be utilized to horizontally and vertically delineate groundwater impacts associated with AOC 10. The following table summarizes the construction details of these monitoring wells.

Monitoring Well ID	Date Drilled	Total Depth	Screened Interval
PER-2	April 2002	9’	2 – 9’
PER-2D	May 2013	30’	25 – 30’
PER-9	September 2013	15’	1 – 15’
PER-9D	September 2013	35’	28 – 35’
PER-9DD	September 2013	65’	55 – 65’
PER-3	April 2002	9’	2 – 9’
PER-3D	July 2013	30’	25 – 30’
PER-10	July 2013	15’	3 – 15’
PER-10D	July 2013	30’	25 – 30’
AB-4R	June 2014	12.5’	2.5 – 12.5’
AB-4D	July 2013	30’	25 – 30’

All well logs and a monitoring well construction table are included in **Appendix 2**.

2.3 Topography and Surface Water

Topography of the Site and surrounding area is generally flat with a very gradual slope towards the Arthur Kill. The total difference in topographic relief on the developed portion of the site is less than 5 feet. Surveyed ground surface elevations indicated that the developed portion of the property, which has an approximate total area of 223 acres, ranges in elevation from 5 to 10 feet above MSL referenced to North American Vertical Datum of 1988 (NAVD88).

A detention basin (AOC 12) is located directly to the east (downgradient) of AOC 10. Stormwater enters the detention basin through overland flow.

3.0 SITE INVESTIGATION ACTIVITIES

The following provides a brief summary of historic releases associated with AOC 10:

- **NJDEP Case # 93-10-21-1435-21 – Historic Spill 10(A)**
  On October 21, 1993, after heavy rainfall, gasoline was identified in a concrete turn-around area at AOC 10 and subsequently, NJDEP Case Number 93-10-21-1435-21 was assigned. Inspection of the sewer box in the immediate area indicated a mixture of gasoline and water was draining into the structure from the subsurface. Samples collected from the sewer box indicated the product to be oxygenated regular grade gasoline. A vacuum truck was deployed to recover product that collected in the sewer box while cleanup of the concrete surface was conducted. No surface water or off-site impacts were documented from this incident. Groundwater monitoring wells were subsequently installed and the investigation is ongoing.

- **NJDEP Case # 97-11-7-1647-16 – Historic Spill 13**
  On November 7, 1997, approximately 50 gallons of gasoline escaped from the Vapor Recovery Unit (VRU) stack into the containment area and NJDEP Case Number 97-11-7-1647-16 was assigned. All material was remediated from the containment area and transferred to the facility slop oil tank for reprocessing. All impacted soil and debris encountered were disposed of at an approved off-site treatment facility. No documentation was available regarding the volumes or location of disposal.

- **NJDEP Case # 06-05-25-1243-17 - Historic Spill 10(B)**
  On May 25, 2006, a fuel line from a diesel pump failed, and approximately one gallon of diesel fuel was released. The spill was subsequently cleaned up and the pump line was repaired.

- **NJDEP Case # 08-08-14-0949-36 – Historic Spill 20**
  On August 8, 2014, gasoline was observed to be flowing from the stormwater system into the Truck Loading Rack tank field during a rainfall event. NJDEP Case Number 08-08-14-0949-36 was assigned to the spill and the gasoline was determined to be residual gasoline present in the drainage system from a past release.

- **Urban Sewer - LNAPL**
  A portion of the Urban Sewer runs through AOC 10. LNAPL was identified in the sewer during routine maintenance, therefore a video inspection of the pipeline was completed. AOC 10 was identified as the source of the LNAPL infiltration. Between August 25, 2014 and August 29, 2014, soil was excavated in order to expose and seal any joints in the sewer line. Due to the presence of high voltage electric lines, the southern end of the sewer line could not be exposed. In 2015, the joints were grouted from the inside using automated technology.

A tight clay layer was encountered beneath the asphalt and gravel base during soil excavation activities to seal the joints in the sewer line. LNAPL appeared to be migrating along the gravel base layer beneath the asphalt. In addition to sealing the joints of the sewer line, an interceptor trench was also installed to an approximate depth of two (2) feet below grade. A recovery sump was installed in the trench to allow for LNAPL recovery via a vacuum truck.

3.1 Groundwater Investigation

3.1.1 Monitoring Well Installation

In November 1993, four (4) groundwater monitoring wells were installed. The wells were designated TR-1 through TR-4) (formerly known as MW-1 through MW-4) due to the October 1993 gasoline release (NJDEP Case 93-10-21-1435-21) which occurred in AOC 10. The details of the release are summarized above in Section 3.0.

In October 2009, seventeen (17) temporary wells designated as TR-TW-1 through TR-TW-17 were installed to investigate and delineate groundwater impacts detected during previous groundwater sampling events.

Monitoring wells TR-5 and TR-6 were installed in October 2010 as a result of the analytical results from the October 2009 temporary well investigation. In 2012 and 2013, the groundwater monitoring wells were installed to vertically delineate impacts in AOC 10 in both the intermediate (TR-4D and TR-6D) and deep groundwater zones (TR-4DD).

Several monitoring wells (TR-2, TR-3, and TR-4) were replaced in 2008 (TR-2 & TR-3) and 2012 (TR-4) due to improper construction. The replacement wells were constructed to ensure that the well screen was above the static groundwater table.

Monitoring wells associated with other Site AOCs are included in the groundwater analytical evaluation (see **Section 1.1.3**) if the wells are located down or side-gradient from AOC 10. These wells include PER-2, PER-2D, PER-9, PER-9D, PER-9DD, PER-3, PER-3D, PER-10, PER-10D, AB-4R, and AB-4D. A groundwater contour map is included as **Figures 3a - 3c**.

3.1.2 Light Non-Aqueous Phase Liquid (LNAPL)

Free product has been historically observed in monitoring wells TR-2 (as well as the replacement well TR-2R) and TR-4 in AOC 10. LNAPL Interim Remedial Measures (IRM) have been conducted by HC-PR since 1998. The IRM utilized a vacuum truck to remove groundwater from the area. The groundwater remediation activities have reduced the LNAPL thickness from 3.32 feet in monitoring well TR-2/TR-2R in 2001 to 0.03 feet in October 2015, with no measurable LNAPL detected in November 2015. The area of LNAPL appears to be present in the immediate vicinity of monitoring well TR-2R only. No LNAPL was detected in any of the other AOC 10 wells during the 2015 gauging events.

3.1.3 Historic Groundwater Analytical Evaluation

The following is a brief groundwater evaluation based upon analytical results from the nine (9) monitoring wells associated with AOC 10 groundwater samples collected between 2002 and 2014. The main contaminants of concern detected during this time period include compounds

typically associated with gasoline and fuel oil including benzene, ethylbenzene, methyl tertiary butyl ether (MTBE), tertiary butyl alcohol (TBA), toluene, and Xylenes.

Volatile Organic Compounds

The following tables summarize the historic VOC exceedances:

2002 – 2009 VOC Exceedances

Sample ID	NJ GWQS	TR-3	TR-4	TR-3R	TR-4	TR-2R	TR-4	TR-2R	TR-5	TR-6
Date		5/13/02	5/13/02	09/02/09	08/31/09	09/07/10	09/10/10	09/19/11	09/22/11	09/22/11
Volatile Organic Compounds										
Benzene	1	2,120	1,630	1,400	8,750	38,000	2,260	326	14,100	657
Ethyl benzene	700	ND	ND	180	ND	418,000	ND	454	2,070	109
Methyl Tert Butyl Ether (MTBE)	70	7,980	1,280,000	6,470[a]	2,070,000[b]	1,540,000	1,580,000[a]	9,050[a]	51,200[b]	16,200[a]
Tert Butyl Alcohol	100	NA	NA	50,500[a]	295,000	ND	ND	1,160	35,200	206 J
Toluene	600	ND	ND	30.9	ND	405,000	ND	546	91.6 J	200
Xylene (total)	1000	ND	ND	61	ND	2,390,000	ND	946	70.7 J	169

2012 VOC Exceedances

Sample ID	NJ GWQS	TR-4R	TR-4D	TR-5	TR-6
Date		11/26/12	11/26/12	12/14/12	11/26/12
Volatile Organic Compounds					
Benzene	1	154	ND	98.1	664
Methyl Tert Butyl Ether (MTBE)	70	81.0	75,600	140	8,750
Tert Butyl Alcohol	100	267	5,910 J	69.0	8,350

2013 VOC Exceedances

Sample ID	NJ GWQS	TR-3RR	TR-4DD	TR-6D	TR-1R	TR-3RR	TR-4R	TR-5	TR-6	TR-6D	TR-4D	TR-4DD
Date		07/25/13	07/25/13	07/25/13	11/11/13	11/11/13	11/11/13	11/11/13	11/11/13	11/11/13	12/04/13	12/04/13
Volatile Organic Compounds												
Benzene	1	233	ND	57.9	14.2	1,240	317	5,940[a]	3,980	6.8	ND	ND
Methyl Tert Butyl Ether (MTBE)	70	3,040[a]	483[a]	1,570[a]	5.0	7,660	118.0	6,330[a]	82,500	71.7	82,200	414
Tert Butyl Alcohol	100	4,270	ND	248	ND	24,400	290	5,610	18,400	18.0 J	23,100	ND
Xylene (total)	1000	260	ND	34.6 J	2.0	48.7 J	77.3	356	1,080	1.8 J	ND	ND

2014 VOC Exceedances

Sample ID	NJ GWQS	TR-3RR	TR-4R	TR-4D	TR-5	TR-6
Date		11/20/14	11/20/14	11/20/14	11/20/14	11/20/14
Volatile Organic Compounds						
Benzene	1	0.30 J	48.3	36.8	6,650[a]	11.9
Methyl Tert Butyl Ether (MTBE)	70	253[k]	5.8	104,000[b]	2,760[a]	972[a]
Tert Butyl Alcohol	100	124	36.5	118,000[a]	9,800[a]	71.0

Semi-Volatile Compounds

SVOC compounds have only been historically detected in wells where LNAPL has been observed (TR-2R and TR-4R).

Sample ID	NJ GWQS	TR-2R	TR-2R	TR-4R	TR-4R
Date		09/07/10	09/19/11	11/26/12	11/20/14
Semi-Volatile Organic Compounds					
Benzo(a) anthracene	0.1	1.07	0.618	0.194	0.123
Benzo(a) pyrene	0.1	0.437	0.292	0.162	0.112
Benzo(b) fluoran thene	0.2	0.497	0.399	0.301	0.233
Naphtha lene	300	321[a]	274[a]	1.15	19.6
2-Methyl naph thalene	30	211[a]	237[a]	ND	1.3

Metals

Lead has been historically detected in AOC 10 wells with the highest concentration of 142 parts per billion (ppb) detected in monitoring well TR-4R during the November 2014 groundwater sampling event. The NJDEP GWQS for lead is 5 ppb.

3.1.4 2009 Temporary Well Analytical Results Summary

In October 2009, seventeen (17) temporary monitoring wells were installed in AOC 10 (TR-TW-1 through TR-TW-17) and groundwater samples were collected from each well. A groundwater sample was not collected from temporary well TR-TW-14 due to the presence of LNAPL. The following tables summarize the groundwater exceedances detected during the 2009 sampling event. Investigation activities and results are summarized in the November 2012 RIR prepared by EnviroTrac (**Appendix 6**).

Volatile Organic Compounds

Sample ID:	GWQS (ppb)	TR-TW-2	TR-TW-3	TR-TW-4	TR-TW-5	TR-TW-6	TR-TW-7	TR-TW-8	TR-TW-9	TR-TW-10	TR-TW-13	TR-TW-15	TR-TW-16	TR-TW-17
Volatile Organic Compounds (VOCs)														
Benzene	1	**13.9**	**76.4**	**6.7**	**15,800**	**21,900**	**1,420**	**16,700**	**3,320**	**9,810**	**7,930**	**4.3**	**1.5**	**9.1**
cis-1,2-Dichloroethene	70	ND	ND	ND	ND	ND	ND	ND	**2,300**	ND	ND	ND	ND	ND
Ethylbenzene	700	23.2	84.1	1.2	**5,120**	**2,080**	**933**	**93,400**	**1,640**	**2,970**	**1,950**	109	2.5	8.6
Methyl Tert Butyl Ether	70	16.7	**94.2**	**74.8**	**455,000**	**1,080,000**	**1,360**	**365,000**	**335**	**252,000**	**175,000**	3	6.7	49.4
Toluene	600	2.3 J	33.9	1	ND	**22,500**	26.5	**123,000**	**6,320**	**6,550**	**9,960**	1.3	7.8	27.6
Vinyl chloride	1	ND	ND	ND	ND	ND	ND	ND	**171**	ND	ND	ND	ND	ND
Xylene (total)	1,000	14.3	793	0.98 J	**4,870**	**10,300**	65	**533,000**	**7,530**	**11,600**	**7,370**	186	7.2	25.9

Semi-Volatile Organic Compounds

Sample ID:	GWQS (ppb)	TR-TW-1	TR-TW-2	TR-TW-3	TR-TW-4	TR-TW-5	TR-TW-6	TR-TW-7	TR-TW-8	TR-TW-9	TR-TW-10	TR-TW-13	TR-TW-16
Semi-Volatile Organic Compounds (SVOCs)													
Benzo(a)anthracene	**0.1**	**6.2**	**13.9**	ND	**7.14**	ND	ND	ND	**24.5**	**10.6**	**5.49**	**1.7**	**0.436**
Benzo(a)pyrene	**0.1**	**4.03**	**5.55**	ND	ND	ND	ND	ND	**34.6**	**3.04**	**1.49**	**0.76**	**0.336**
Benzo(b)fluoranthene	**0.2**	**9.4**	**9.22**	ND	ND	ND	ND	ND	**48.4**	**4.62**	**1.95**	**1.44**	**0.555**
Benzo(k)fluoranthene	**0.5**	**4**	**4.54**	ND	ND	ND	ND	ND	**22.3**	**2.09**	**0.922 J**	0.287	0.285
Chrysene	**5**	4.22	**8.65**	ND	**5.35**	ND	ND	ND	**18.9**	**6.11**	2.54	1.41	0.463
Dibenzo(a,h)anthracene	**0.3**	**0.555**	**3.11**	ND	ND	ND	ND	ND	**11.8**	ND	ND	0.23	ND
Indeno(1,2,3-cd)pyrene	**0.2**	**2.7**	**6.74**	ND	ND	ND	ND	ND	**21.7**	**3.42**	ND	**0.445**	**1.28**
Naphthalene	**300**	15.3	134	175	15.7	**341**	**437**	**357**	**23,500**	**1,550**	**1,350**	**728**	0.946
Phenanthrene	**100**	10.7	91.5	ND	36.8	ND	4.62	5.24	**2,270**	82.9	33	51.5	0.271
Pyrene	**200**	12.2	68.1	ND	11.6	ND	2.48	1.67	**293**	21.5	8.34	5.9	0.493
bis(2-Ethylhexyl)phthalate	**3**	**7.5**	**1,080**	ND	**15.4**	ND	ND	ND	ND	ND	**20.2**	**10.6**	**5.4**
2-Methylnaphthalene	**30**	19.1	**685**	**225**	**75.3**	**111**	**281**	**242**	**33,600**	**1,950**	**1,360**	**632**	ND

The 2009 groundwater analytical results are summarized on **Table 1**. Temporary well logs are included in **Appendix 3**. The locations of the temporary wells are illustrated on **Figure 4**.

3.1.5 2010 & 2013 Temporary Well Analytical Results Summary – Adjacent AOCs

In addition to the temporary well investigation activities conducted directly in AOC 10, temporary wells were also installed in adjacent AOCs (AOC 8 & AOC 57). In September 2010, seven (7) temporary wells were installed in AOC 57 – Day Tank Field, located to the south of AOC 10. In June 2012, three (3) temporary wells were installed in AOC 8 – Waste Container Storage Area, located to the east of AOC 10. The following tables summarize the groundwater exceedances detected during the 2010 and 2012 sampling events within adjacent AOCs 8 and 57. Investigation activities and results are summarized in the November 2012 RIR prepared by EnviroTrac (**Appendix 6**).

AOC 57 Temporary Well Analytical Results (2010)

Sample ID:	GWQS (ppb)	HS8-TW-2	HS8-TW-3
Volatile Organic Compounds (VOCs)			
Benzene	**1**	**490**	ND
Tert Butyl Alcohol	**100**	**1,190**	ND
Semi-Volatile Organic Compounds (SVOCs)			
Benzo(a)anthracene	0.1	**0.35**	ND
Benzo(a)pyrene	0.1	**0.111**	ND
bis(2-Ethylhexyl)phthalate	3	**3.2**	**7.7**
2-Methylnaphthalene	30	**829**	ND

AOC 8 Temporary Well Analytical Results (2012)

Sample ID:	GWQS (ppb)	DC-TW-1	DC-TW-2	DC-TW-3
Volatile Organic Compounds (VOCs)				
Benzene	**1**	**59.4**	**4,490**	ND
Ethylbenzene	**700**	44.3	**880**	ND
Methyl Tert Butyl Ether	**70**	24.7	**4,130**	15.4
Vinyl chloride	**1**	**9.06**	ND*	ND
Semi-Volatile Organic Compounds (SVOCs)				
Benzo(a)anthracene	0.1	**0.205**	**1.99**	**2.01**
Benzo(a)pyrene	0.1	ND	**0.900**	**1.34**
Benzo(b)fluoranthene	0.2	ND	**0.895**	**1.69**
Benzo(k)fluoranthene	0.5	ND	**0.550**	**1.28**
Bis(2-Ethylhexyl) phthalate	2	ND	**3.54**	**2.47**
1,4 Dioaxane	0.4	**11.6**	**49.7**	**2.15**
Indeno(1,2,3-cd)pyrene	0.2	ND	**0.325**	**0.976 J**
2-Methylnaphthalene	30	**50.6**	**132**	2.39

The 2009 groundwater analytical results are summarized on **Table 1**. Temporary well logs are included in **Appendix 3**. The locations of the temporary wells are illustrated on **Figure 4**.

3.1.6 2015 - 2016 Groundwater Analytical Results Summary

Annual groundwater sampling was conducted in 2015 and 2016 for AOC 10. The following tables summarize the groundwater exceedances detected during the groundwater sampling events.

2015 Groundwater Analytical Results

Volatile Organic Compounds

The main VOCs associated with AOC 10 include benzene, MTBE, TBA and Xylenes. As illustrated in the tables below, low levels of chlorinated VOCs, 1,1-dichloroethene and trichloroethene, were detected in monitoring wells TR-1R and TR-4DD. No VOC exceedances were detected in monitoring well TR-6D. Benzene, MTBE, and TBA were detected in down-gradient monitoring wells in the intermediate groundwater zone.

AOC 10 Wells

Client Sample ID:		NJ GWQS	TR-1R	TR-2R	TR-3RR	TR-4D	TR-4DD	TR-4R	TR-5R	TR-6
Date Sampled:			11/19/2015	11/19/2015	11/19/2015	11/19/2015	11/19/2015	11/19/2015	11/19/2015	11/19/2015
GC/MS Volatiles (SW846 8260C)										
Benzene	ug/l	1	ND (0.24)	**912**	**3.8**	**6.1**	ND (0.24)	**52.5**	**1200**	**426**
1,1-Dichloroethene	ug/l	1	**2.1**	ND (0.51)	ND (2.6)	ND (5.1)	**3.1**	ND (0.51)	ND (5.1)	ND (0.51)
Methyl Tert Butyl Ether	ug/l	70	ND (0.24)	**2480**	**1530**	**9120**	6.2	7.2	**1370**	**6690**
Tert Butyl Alcohol	ug/l	100	ND (2.8)	**151**	**1850**	**39400**	16.4	**101**	**1240**	**1720**
Trichloroethene	ug/l	1	ND (0.22)	ND (0.22)	ND (1.1)	ND (2.2)	**3.2**	ND (0.22)	ND (2.2)	ND (0.22)
Xylene (total)	ug/l	1000	ND (0.17)	**1120**	ND (0.83)	ND (1.7)	ND (0.17)	174	33.5	21.3

Down-gradient/Side-gradient Wells

Client Sample ID:		NJ Groundwater	PER-10D	PER-2D	PER-3D
Date Sampled:			11/23/2015	11/20/2015	11/23/2015
GC/MS Volatiles (SW846					
Benzene	ug/l	1	**2**	ND (0.24)	ND (0.24)
Methyl Tert Butyl Ether	ug/l	70	25.7	**693**	**77**
Tert Butyl Alcohol	ug/l	100	35	**204**	45.8

Semi-Volatile Organic Compounds

The following is a summary of the SVOC exceedances detected in the AOC 10 wells during the November 2015 sampling event. The SVOCs detected in monitoring well TR-2R are likely due to the sporadic presence of LNAPL in the well.

Client Sample ID:		NJ GWQS	TR-2R	TR-4D	TR-4DD
Date Sampled:			11/19/2015	11/19/2015	11/19/2015
GC/MS Semi-volatiles (SW846					
Benzo(a)anthracene	ug/l	0.1	**5.3**	-	-
1,4-Dioxane	ug/l	0.4	ND (0.76)	**1.3**	**0.78 J**
2-Methylnaphthalene	ug/l	30	**55.2**	ND (0.31)	ND (0.31)
Benzo(a)pyrene	ug/l	0.1	**3.41**	ND (0.031)	ND (0.031)
Benzo(b)fluoranthene	ug/l	0.2	**4.47**	ND (0.022)	ND (0.022)
Benzo(k)fluoranthene	ug/l	0.5	**1.63**	ND (0.020)	ND (0.020)
Dibenzo(a,h)anthracene	ug/l	0.3	**0.457**	ND (0.037)	ND (0.037)
Indeno(1,2,3-cd)pyrene	ug/l	0.2	**1.41**	ND (0.033)	ND (0.033)

Metals

Several metals exceeded the GWQS during the November 2015 groundwater sampling event. However, the GWQS for aluminum, iron, manganese, and sodium are not health based standards and are based on secondary characteristics. Exceedances of beryllium, cadmium, and arsenic are likely due to background levels common to NJ or due to the presence of historic fill. Therefore, these metals are not considered contaminants of concern for AOC 10. Lead is the only metal considered a contaminant of concern for AOC 10. Lead groundwater impacts could also be potentially attributed to the presence of historic fill on the Site. The following table summarizes lead exceedances for AOC 10 wells.

Client Sample ID:		NJ GWQS	TR-1R	TR-3RR	TR-4R	TR-6
Date Sampled:			11/19/2015	11/19/2015	11/19/2015	11/19/2015
Metals Analysis						
Lead	ug/l	5	**22.0** [f]	**5.1**	**22.8**	**5.2**

The 2015 groundwater analytical results are summarized on **Table 2** and **Figures 5a - 5d**. Low flow groundwater purge sheets are included as **Appendix 4.**

2016 Groundwater Analytical Results

The following tables summarize the groundwater exceedances detected during the 2016 groundwater sampling event.

Shallow Groundwater Monitoring Well Exceedances

Sample ID:	GWQS (ppb)	TR-1R	TR-2R	TR-3RR	TR-4R	TR-5	TR-6	PER-1
GC/MS Volatiles (SW846 8260C)								
Benzene	1	ND (0.14)	**204**	**13.2**	**42.2**	**4490**	**179**	ND (0.14)
1,2-Dichloroethane	2	ND (0.39)	**5.8**	ND (2.0)	ND (0.39)	ND (3.9)	ND (3.9)	ND (0.39)
1,1-Dichloroethene	1	**2.1**	ND (0.20)	ND (1.0)	ND (0.20)	ND (2.0)	ND (2.0)	ND (0.20)
Methyl Tert Butyl Ether	70	ND (0.34)	**487**	**765**	9.3	**1200**	**1270**	ND (0.34)
Tert Butyl Alcohol	100	ND (3.0)	**263**	**2820**	ND (3.0)	**3850**	**575**	ND (3.0)
Metals Analysis								
Aluminum	200	**423**	**371**	**1090**	**304**	**2640**	**664**	**9510** [b]
Antimony	6	<6.0	**12.2**	<6.0	<6.0	**7.4**	**8.8**	<12 [b]
Arsenic	3	<3.0	**7.1**	**3.8**	**14.1**	**12.9**	**11.7**	**7.8** [b]
Iron	300	**689**	**414**	**1340**	**771**	**6220**	**1440**	**9890** [b]
Lead	5	<3.0	<3.0	4	<3.0	**7.6**	<3.0	**35.8** [b]
Manganese	50	**51.2**	**94.2**	**755**	22	**2250**	**469**	**3120** [b]
Sodium	50,000	42,400	**82,700**	18,700	**202,000**	**354,000**	11,600	<20000 [b]
GC/MS Semi-volatiles (SW846 8270D)								
bis(2-Ethylhexyl)phthalate	3	ND (1.7)	ND (1.7)	ND (1.7)	**4**	ND (1.7)	ND (1.8)	ND (1.7)
2-Methylnaphthalene	30	ND (0.21)	20	ND (0.21)	**111**	3	ND (0.22)	ND (0.21)
Benzo(a)anthracene	0.1	ND (0.023)	**1.1**	ND (0.023)	ND (0.023)	ND (0.023)	ND (0.024)	**0.11**
Benzo(a)pyrene	0.1	ND (0.033)	**0.282**	ND (0.034)	ND (0.034)	ND (0.034)	ND (0.035)	ND (0.034)
Benzo(b)fluoranthene	0.2	ND (0.043)	**0.36**	ND (0.044)	ND (0.044)	ND (0.044)	ND (0.046)	ND (0.044)

Intermediate Groundwater Monitoring Well Exceedances

Sample ID:	GWQS (ppb)	TR-4D	TR-6D
GC/MS Volatiles (SW846 8260C)			
Benzene	1	**5.8 J**	0.40 J
1,1-Dichloroethene	1	ND (4.1)	**2.8**
1,2-Dichloropropane	1	ND (6.5)	**1.4**
Methyl Tert Butyl Ether	70	**6010**	11.1
Tert Butyl Alcohol	100	**64,700**	25.8
Tetrachloroethene	1	ND (4.7)	**3.8**
Trichloroethene	1	ND (5.1)	**1.8**
Metals Analysis			
Aluminum	200	**210**	**476**
Iron	300	108	**354**
Manganese	50	**582**	<15
Sodium	50,000	**120,000**	**59,100**
GC/MS Semi-volatiles (SW846 8270D)			
bis(2-Ethylhexyl)phthalate	3	**4.6**	ND (1.7)
1,4-Dioxane	0.4	**1.49**	**0.941**

Deep Groundwater Monitoring Well Exceedances

Sample ID:	GWQS (ppb)	TR-4DD
GC/MS Volatiles (SW846 8260C)		
1,1-Dichloroethene	1	**2.7**
Trichloroethene	1	**2.9**
Metals Analysis		
Aluminum	200	**1030**
Arsenic	3	**3.7**
Cadmium	4	**4.4**
Iron	300	**3930**
Lead	5	**5.2**
Manganese	50	**148**
Sodium	50000	**54,900**
GC/MS Semi-volatiles (SW846 8270D)		
bis(2-Ethylhexyl)phthalate	3	**30.3**
Benzo(a)anthracene	0.1	**0.202**
1,4-Dioxane	0.4	**0.657**

The 2016 groundwater analytical results are summarized on **Table 3** and **Figures 6a – 6e**. Low flow groundwater purge sheets are included in **Appendix 4**.

4.0 REMEDIAL INVESTIGATION WORKPLAN

Based upon the investigation activities conducted to date, the RIW proposes the following actions to be performed at the Truck Loading Rack:

- Soil Investigation
- Monitoring Well Installation (horizontal and vertical delineation)

4.1 Soil Investigation

In accordance with NJDEP's TRSR, the extent of groundwater impacts must be delineated both horizontally and vertically to the GWQS. In addition, the source of impacts needs to be investigated. If impacted soil can be identified, and remediated, the condition of groundwater should improve significantly.

A series of soil borings will be installed across the accessible portions of AOC 10 using a hand-auger/air knife equipment to 6 feet below grade. Once a depth of 6 feet is achieved, a Geoprobe will be used to install the soil boring to the proposed final depth. Borings will be installed in phases, initially fifteen (15) borings will be installed to assess subsurface conditions in the vicinity of known impacted wells, within the truck loading rack area, and along the western perimeter of the AOC. The locations of the proposed borings are illustrated on **Figure 7**. If additional delineation is necessary, supplemental soil borings will be installed as appropriate.

Soil borings will be field screened with a calibrated photoionization detector (PID) and lithology will be logged in a dedicated field book. Based upon a review of soil borings historically installed in this area, PID readings have been detected to a depth of 25 feet below grade. Therefore, soil borings will be advanced to either a maximum depth of 30 feet below grade, when no indications of impacts are observed, or refusal. One (1) soil sample will be collected for approximately every 6 feet of the soil column, biased toward any indications of impacts. Soil samples will be collected for Target Compound List Volatile Organic Compounds plus a forward library search (TCL VO+15), Target Analyte List metals (TAL metals), and Extractable Petroleum Hydrocarbons (EPH). The soil analytical results will be compared to the NJDEP's Soil Remediation Standards (SRS), N.J.A.C. 7:26D, to determine whether any contaminants exceeded applicable NJDEP Residential and /or Non-Residential Direct Contact Soil Remediation Standards (RDCSRS and NRDCSRS).

The locations of the proposed soil borings are illustrated on **Figure 7.**

4.2 Monitoring Well Installation

The extent of groundwater impacts must be delineated both horizontally and vertically to the GWQS. The interpreted groundwater flow direction at the site is to the south-southeast. Based upon this groundwater flow direction, shallow groundwater impacts have been delineated for AOC 10. However, intermediate and deep groundwater impacts still require delineation.

In the 2015 & 2016 groundwater sampling events, benzene, MTBE, and TBA were detected above the GWQS in shallow wells TR-2R, TR-3RR, and TR-5. Xylenes were also detected over the GWQS in well TR-2R. Therefore, intermediate depth wells will be installed adjacent to TR-2R, TR-3RR, and TR-5 for vertical delineation purposes (TR-2D, TR-3D, and TR-5D). Once the new intermediate wells are sampled, a determination will be made whether additional vertical delineation is necessary. If additional vertical delineation is necessary, deep wells measuring 60

feet in depth will be installed adjacent to the shallow and intermediate well pair (TR-2DD, TR-3DD, and TR-5DD).

In addition, MTBE and TBA were detected in intermediate well PER-2D in excess of the GWQS in 2015 and 2016. Therefore, a deep well will be installed adjacent to monitoring well PER-2D in order to vertically delineate groundwater impacts. In addition, horizontal delineation of the intermediate zone is required south of monitoring well PER-2D. Monitoring well TR-7D is proposed to be installed at the property line, approximately 30 feet south of monitoring well PER-2D. Once monitoring wells PER-2DD and TR-7D are installed and subsequently sampled, a determination will be made whether additional delineation is necessary for the deep groundwater zone. If necessary, monitoring well TR-7DD will be installed adjacent to monitoring well TR-7D.

Groundwater samples will be collected and analyzed for VOCs, Metals, and SVOCs.

Proposed Well ID	Proposed Total Depth	Proposed Screen Length	Location (Purpose)
TR-2D	25’	5’	Vertical delineation of TR-2R
TR-2DD	60’	5’	Possible vertical delineation of TR-2D
TR-3D	25’	5’	Vertical delineation of TR-3R
TR-3DD	60’	5’	Possible vertical delineation of TR-3D
TR-5D	25’	5’	Vertical delineation of TR-5
TR-5DD	60’	5’	Possible vertical delineation of TR-5D
PER-2DD	60’	5’	Vertical delineation of PER-2D
TR-7D	25’	5’	Horizontal delineation of PER-2D
TR-7DD	60’	5’	Possible vertical delineation of PER-7D

The proposed monitoring well locations are illustrated on **Figure 8.**

4.3 Quality Assurance Project Plan

Samples will be collected in accordance with the sampling procedures outlined in the Quality Assurance Project Plan (QAPP), which is included as **Appendix 6.** The QAPP will provide guidance to the project team to ensure all field activities are completed in a manner consistent with the NJDEP requirements and that all data produced is of sufficient quality to meet NJDEP standards. Analytical data packages will be presented in the New Jersey Reduced Deliverables Format, including electronic disk deliverables (EDDs).

4.4 Health and Safety Plan

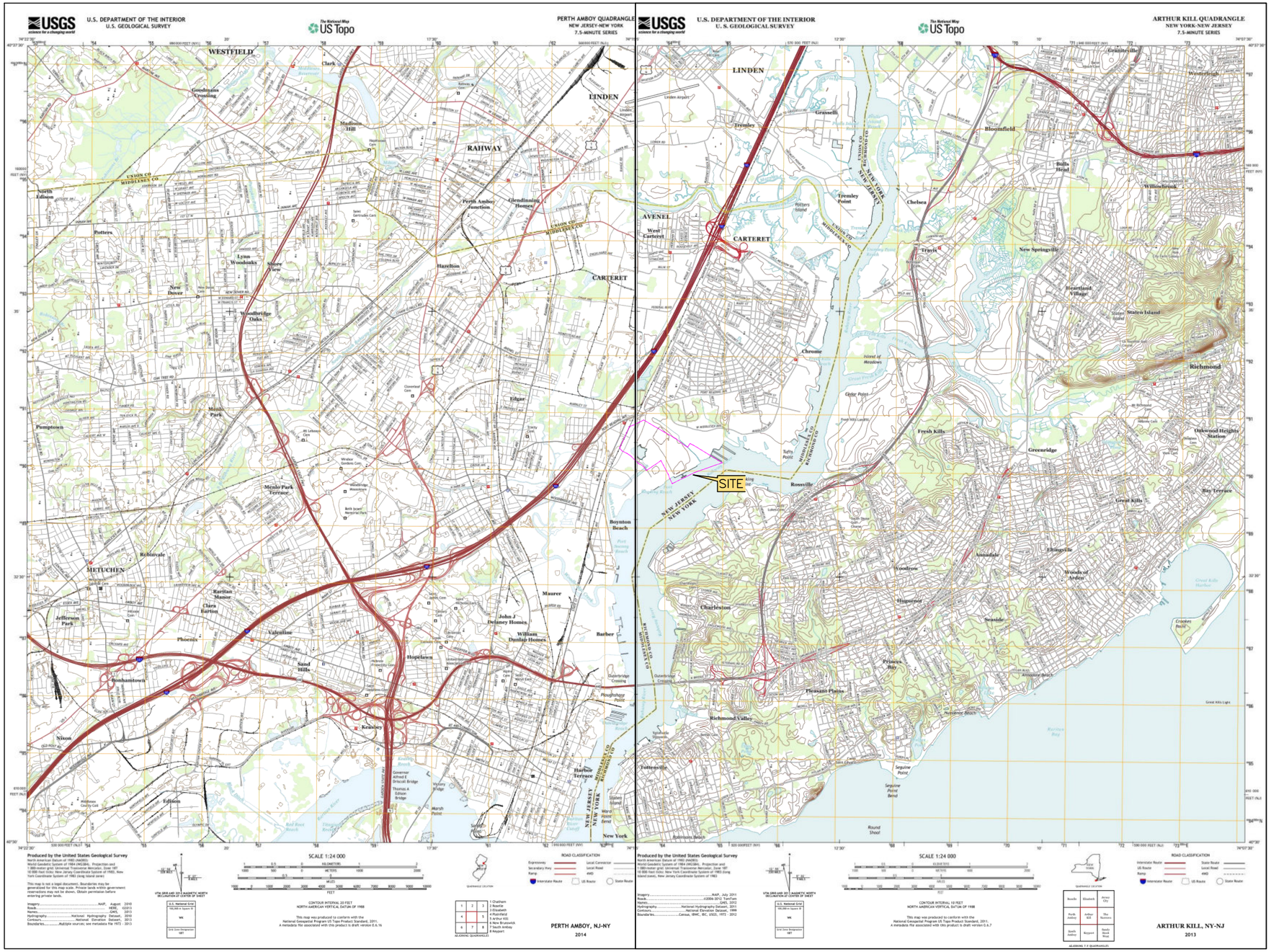
A site specific Health and Safety Plan (HASP) will be prepared in accordance with N.J.A.C. 7:26E-1.9. All site personnel will be informed prior to performing any site activities of all health and safety protocol.

5.0 SCHEDULE

This RIW proposes remedial investigation activities related to AOC 10: Truck Loading Rack. In accordance with the TRSR, Earth Systems will provide the NJDEP with 14 days notice of all field investigation activities prior to the commencement of work. Earth Systems will provide the NJDEP and the EPA with the analytical results of the investigation in a RIR within 90 days of completion

of field activities. If warranted, the RIR will include proposals for additional soil and groundwater investigation as appropriate.

FIGURES



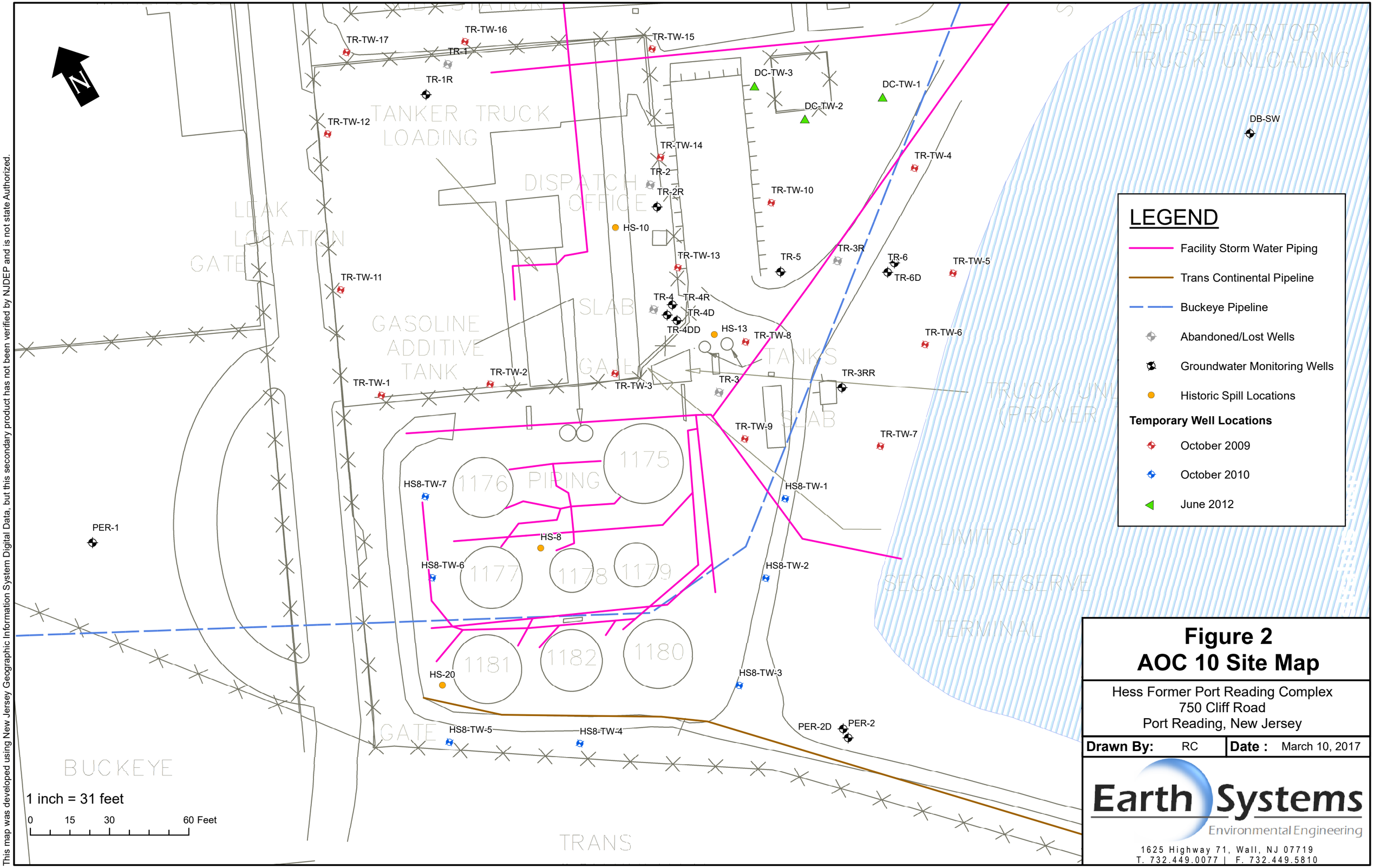
USGS MAP

Hess Corporation Former Port Reading Complex (HC–PR)
750 Cliff Road
Port Reading, New Jersey

Earth Systems

Figure 1

09/15 FIG1



LEGEND

- Facility Storm Water Piping
- Trans Continental Pipeline
- Buckeye Pipeline
- Abandoned/Lost Wells
- Groundwater Monitoring Wells
- Historic Spill Locations

Temporary Well Locations

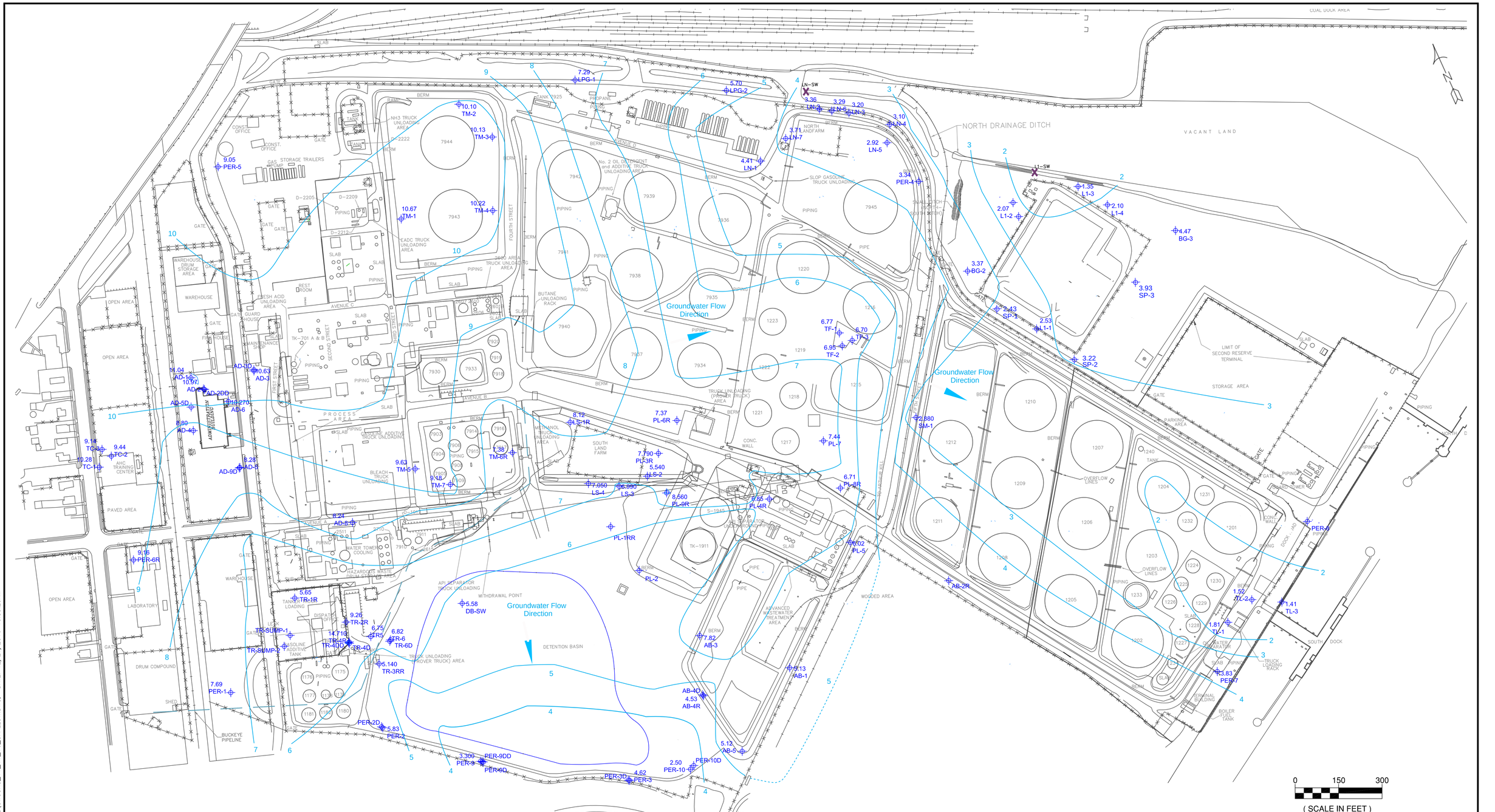
- October 2009
- October 2010
- June 2012

Figure 2
AOC 10 Site Map

Hess Former Port Reading Complex
750 Cliff Road
Port Reading, New Jersey

Drawn By: RC **Date :** March 10, 2017

Earth Systems
Environmental Engineering
1625 Highway 71, Wall, NJ 07719
T. 732.449.0077 | F. 732.449.5810



(SCALE IN FEET)

LEGEND

PL-5 MONITORING WELL LOCATION

GROUND WATER ELEVATION CONTOUR (FEET) DASHED WHERE INFERRED

INTERPRETED GROUND WATER FLOW DIRECTION

SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 14, 2016

HESS CORPORATION

FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 3a

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LEGEND

PL-5 — MONITORING WELL LOCATION

GROUND WATER ELEVATION CONTOUR (FEET) DASHED WHERE INFERRED

INTERPRETED GROUND WATER FLOW DIRECTION

INTERMEDIATE GROUNDWATER CONTOUR MAP NOVEMBER 14, 2016

HESS CORPORATION

FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 3b

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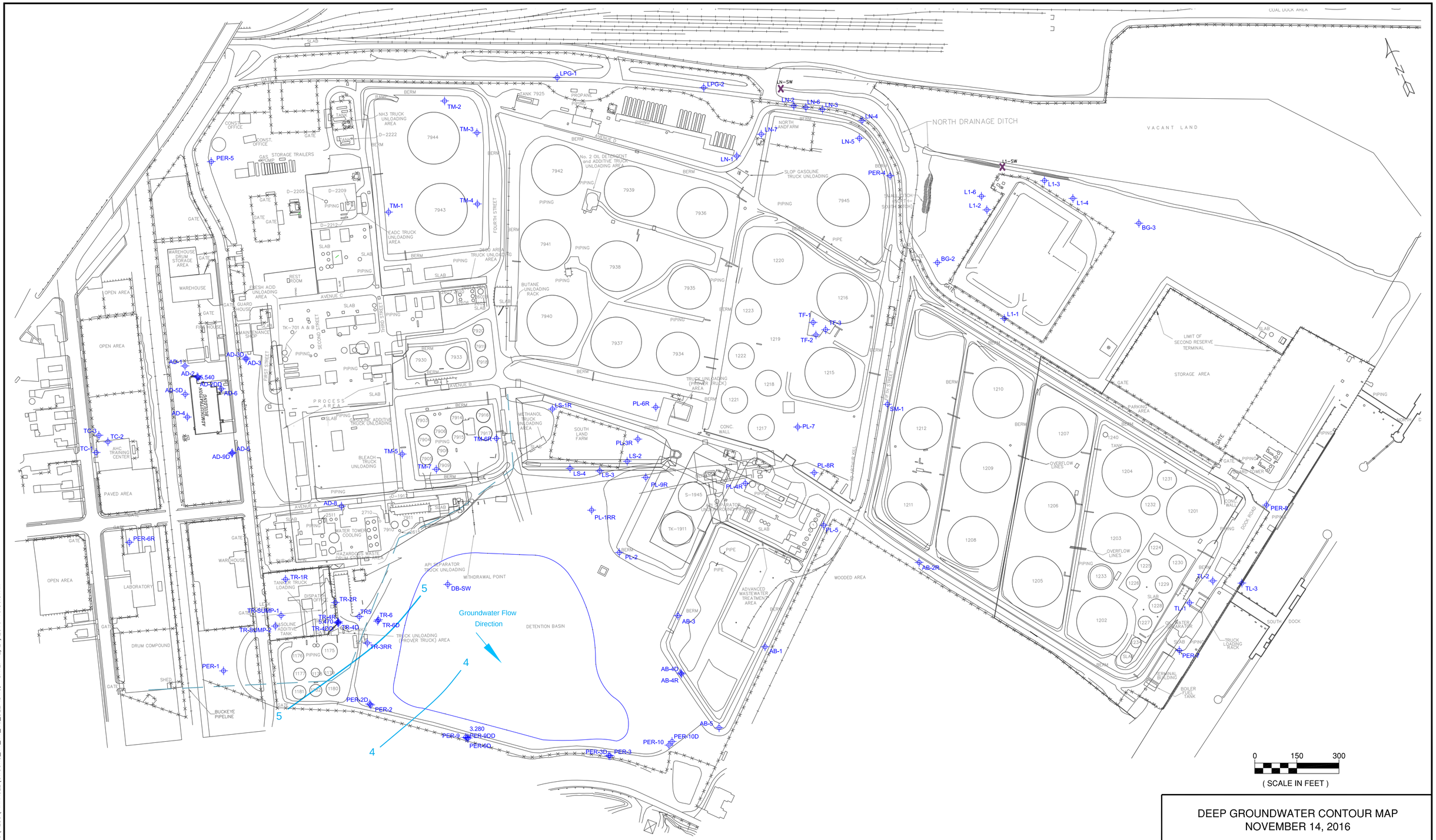

LEGEND

PL-5 MONITORING WELL LOCATION

GROUND WATER ELEVATION CONTOUR (FEET)
DASHED WHERE INFERRED

INTERPRETED GROUND WATER FLOW DIRECTION

DEEP GROUNDWATER CONTOUR MAP
NOVEMBER 14, 2016

HESS CORPORATION

FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 3c

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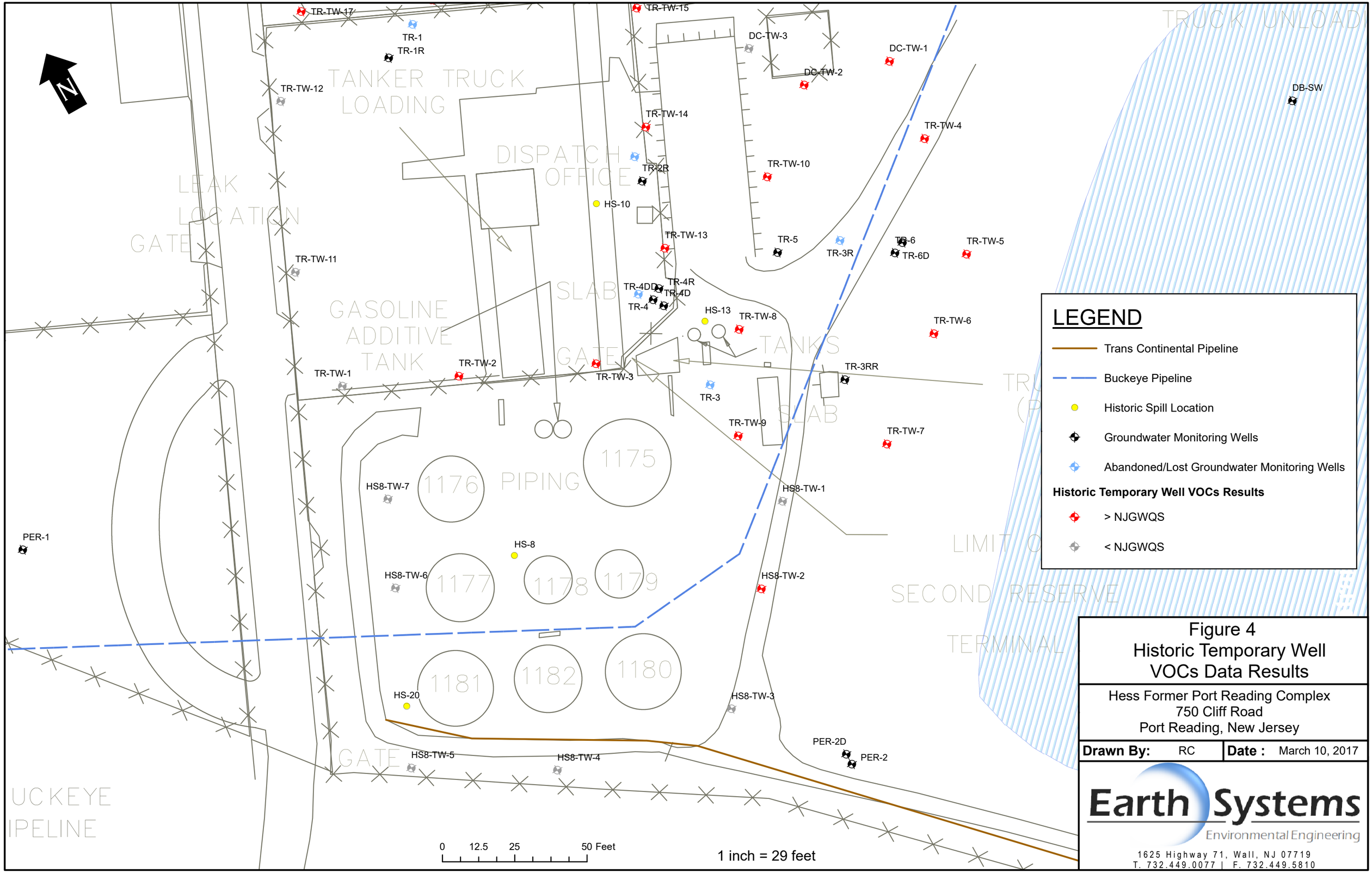
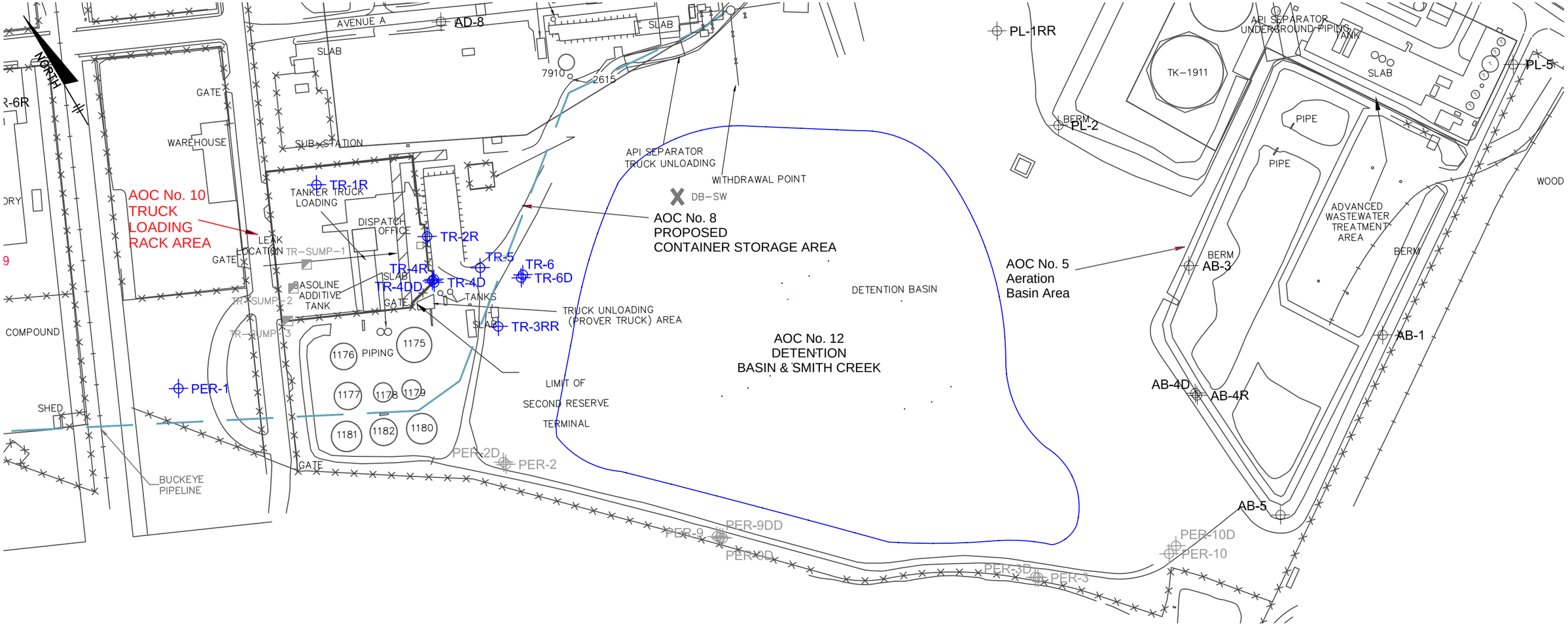


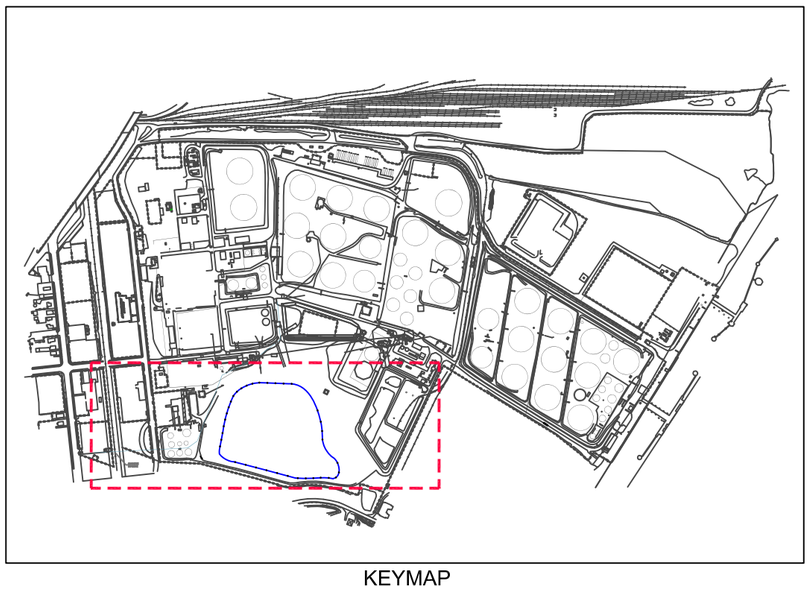
Figure 4
Historic Temporary Well VOCs Data Results

Hess Former Port Reading Complex
750 Cliff Road
Port Reading, New Jersey

Drawn By:	RC	Date :	March 10, 2017

Earth Systems
Environmental Engineering
1625 Highway 71, Wall, NJ 07719
T. 732.449.0077 | F. 732.449.5810





KEYMAP

SCALE: 1"=1000'

Client Sample ID:		GWQS	TR-1R	TR-2R	TR-3RR	TR-4R	TR-4D	TR-4DD	TR-5R	TR-6	TR-6D
GC/MS Volatiles (SW846 8260C)											
Benzene	ug/l	1	ND (0.24)	**912**	**3.8**	**52.5**	**6.1**	ND (0.24)	**1200**	**426**	ND (0.24)
Bromodichloromethane	ug/l	1	ND (0.23)	ND (0.23)	ND (1.1)	ND (0.23)	ND (2.3)	ND (0.23)	ND (2.3)	ND (0.23)	ND (0.23)
1,2-Dibromoethane	ug/l	0.03	ND (0.23)	ND (0.23)	ND (1.2)	ND (0.23)	ND (2.3)	ND (0.23)	ND (2.3)	ND (0.23)	ND (0.23)
1,1-Dichloroethene	ug/l	1	**2.1**	ND (0.51)	ND (2.6)	ND (0.51)	ND (5.1)	**3.1**	ND (5.1)	ND (0.51)	ND (0.51)
Methyl Tert Butyl Ether	ug/l	70	ND (0.24)	**2480**	**1530**	7.2	**9120**	6.2	**1370**	**6690**	20.5
Tert Butyl Alcohol	ug/l	100	ND (2.8)	**151**	**1850**	**101**	**39400**	16.4	**1240**	**1720**	ND (2.8)
Xylene (total)	ug/l	1000	ND (0.17)	**1120**	ND (0.83)	174	ND (1.7)	ND (0.17)	33.5	21.3	ND (0.17)
Total TIC, Volatile	ug/l	-	0	2840 J	0	1422 J	470 J	0	645 J	210.9 J	0

0 150 300

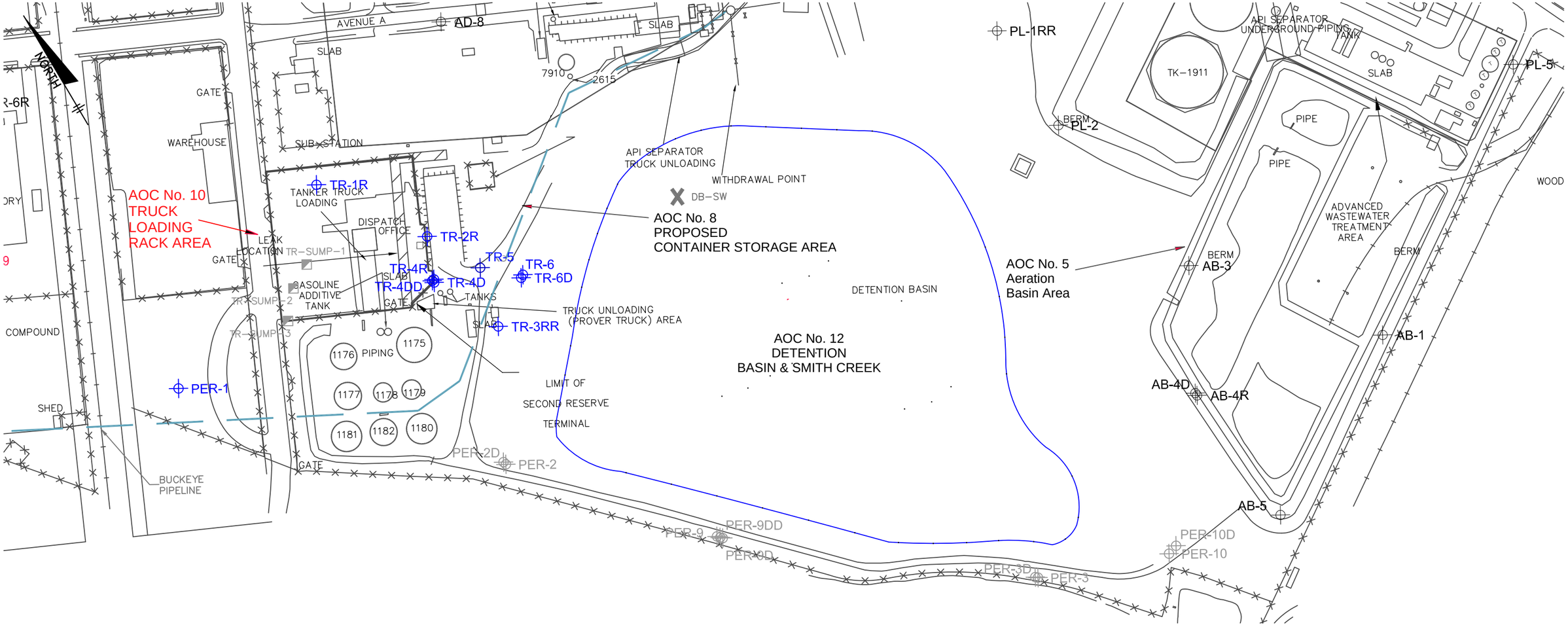
(SCALE IN FEET)

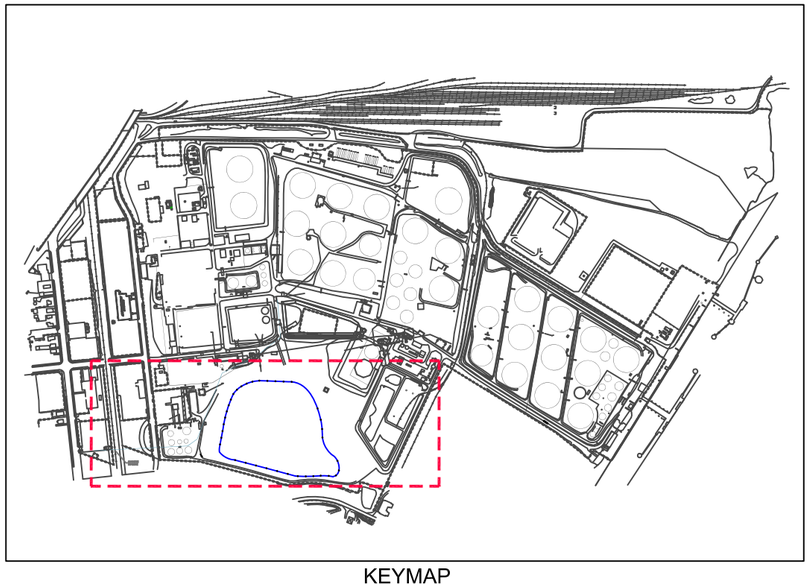
November 2015 Annual Groundwater
Sampling Results
Truck Loading Rack - AOC 10 (VOCs)

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 5a





KEYMAP
SCALE: 1"=1000'

Client Sample ID:		GWQS	TR-1R	TR-2R	TR-3RR	TR-4R	TR-4D	TR-4DD	TR-5R	TR-6	TR-6D
GC/MS Semi-volatiles (SW846 8270D)											
Benzo(a)anthracene	ug/l	0.1	-	**5.3**	-	-	-	-	-	-	-
1,4-Dioxane	ug/l	0.4	ND (0.79)	ND (0.76)	ND (0.75)	ND (0.73)	**1.3**	**0.78 J**	ND (0.73)	ND (0.75)	ND (0.76)
2-Methylnaphthalene	ug/l	30	ND (0.32)	**55.2**	ND (0.31)	2.6	ND (0.31)	ND (0.31)	ND (0.30)	ND (0.31)	ND (0.31)
Benzo(a)pyrene	ug/l	0.1	ND (0.032)	**3.41**	ND (0.031)	ND (0.030)	ND (0.031)	ND (0.031)	ND (0.030)	ND (0.031)	ND (0.031)
Benzo(b)fluoranthene	ug/l	0.2	ND (0.023)	**4.47**	ND (0.022)	ND (0.022)	ND (0.022)	ND (0.022)	ND (0.022)	ND (0.022)	ND (0.022)
Benzo(k)fluoranthene	ug/l	0.5	ND (0.021)	**1.63**	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.021)
Dibenzo(a,h)anthracene	ug/l	0.3	ND (0.039)	**0.457**	ND (0.037)	ND (0.036)	ND (0.037)	ND (0.037)	ND (0.036)	ND (0.037)	ND (0.038)
Hexachlorobenzene	ug/l	0.02	ND (0.016)	ND (0.016)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.015)	ND (0.016)
Indeno(1,2,3-cd)pyrene	ug/l	0.2	ND (0.034)	**1.41**	ND (0.033)	ND (0.032)	ND (0.033)	ND (0.033)	ND (0.032)	ND (0.033)	ND (0.033)
Total TIC, Semi-Volatile	ug/l	-	0	1362 J	0	580.1 J	0	0	229.9 J	38.8 J	0

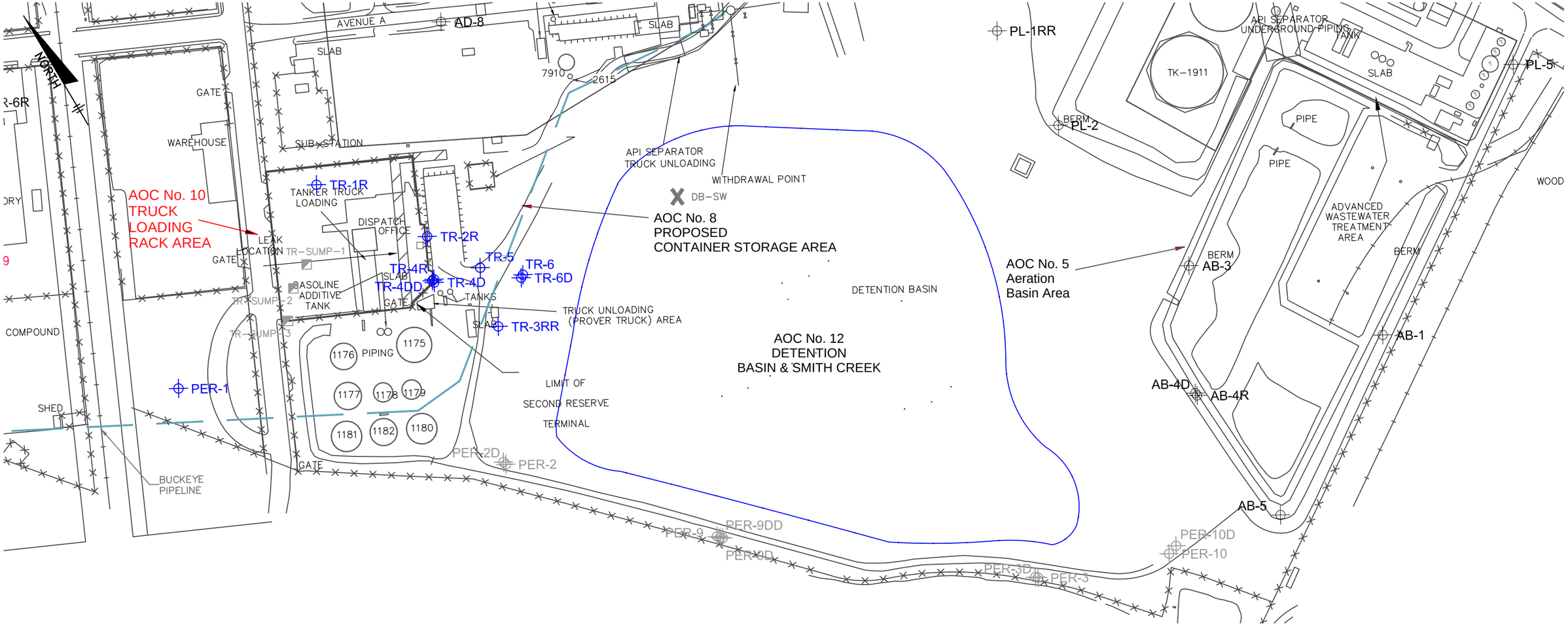
0 150 300
(SCALE IN FEET)

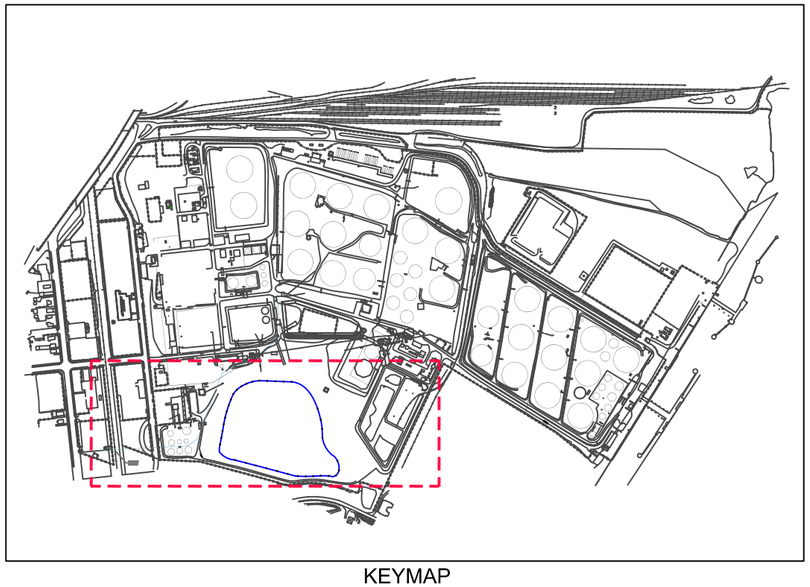
November 2015 Annual Groundwater
Sampling Results
Truck Loading Rack - AOC 10 (SVOCs)

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 5b





KEYMAP
SCALE: 1"=1000'

Client Sample ID:		GWQS	TR-1R	TR-2R	TR-3RR	TR-4R	TR-4D	TR-4DD	TR-5R	TR-6	TR-6D
Metals Analysis											
Aluminum	ug/l	200	**30200 J**	**741**	**1510**	**4450**	<200	**779**	**215**	**996**	**1010**
Antimony	ug/l	6	<12 J	<6.0	<6.0	<6.0	<6.0	<6.0	**6.1**	<6.0	<6.0
Arsenic	ug/l	3	**18.4 J**	**3.5**	**3.3**	**18.8**	<3.0	<3.0	<3.0	**8.4**	<3.0
Beryllium	ug/l	1	**2.4 J**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium	ug/l	4	<6.0 J	**4.2**	<3.0	**4.6**	**6.7**	<3.0	<3.0	<3.0	<3.0
Chromium	ug/l	70	**73.4 J**	22.2	<10	13	<10	<10	<10	<10	<10
Iron	ug/l	300	**48800 J**	**1870**	**2620**	**4610**	176	**3490**	**3280**	**3340**	**487**
Lead	ug/l	5	**22.0 J**	4.3	**5.1**	**22.8**	<3.0	<3.0	<3.0	**5.2**	3.3
Manganese	ug/l	50	**742 J**	**423**	**591**	**147**	**291**	**138**	**1240**	**565**	<15
Sodium	ug/l	50000	40900 J	**315000**	30700	**251000**	**117000**	**57200**	**192000**	23300	20100
General Chemistry											
Nitrogen, Ammonia	mg/l	3	<0.20	2.9	0.21	1.5	<0.20	<0.20	0.44	0.3	<0.20

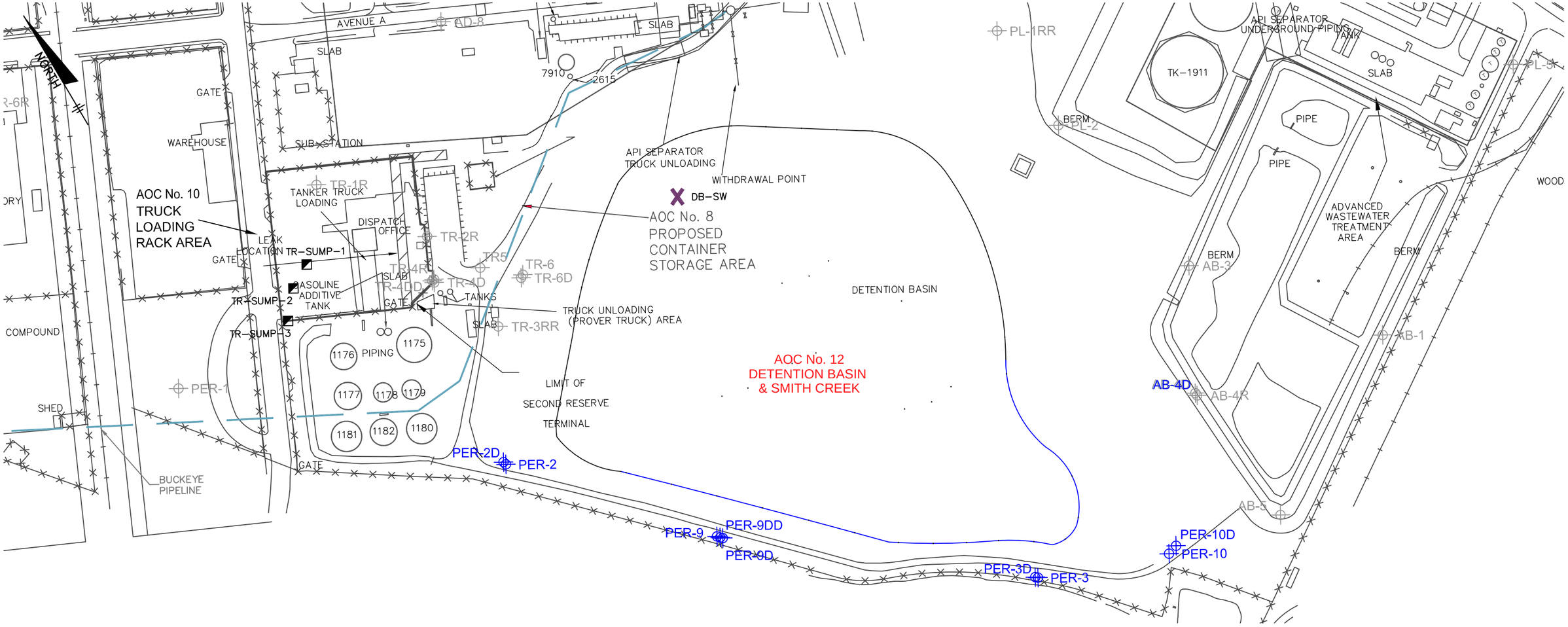
0 150 300
(SCALE IN FEET)

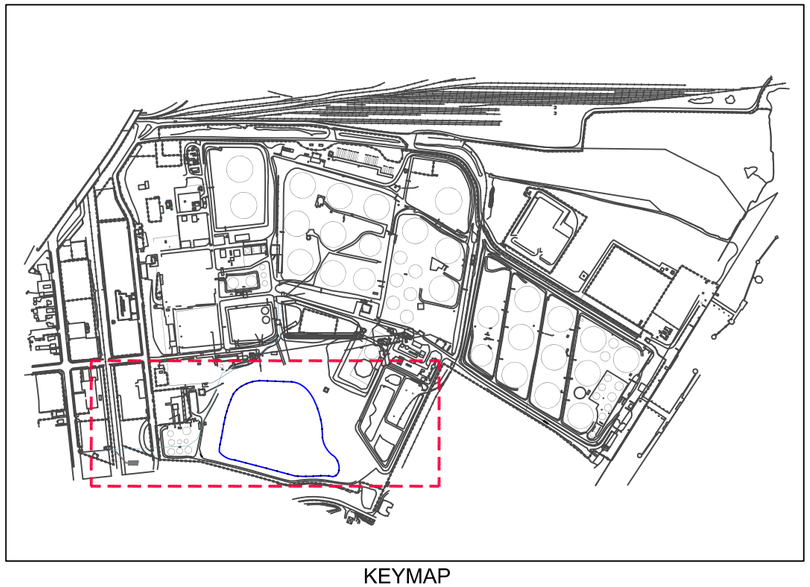
November 2015 Annual Groundwater
Sampling Results
Truck Loading Rack - AOC 10 (Metals/Gen Chemistry)

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 5c





KEYMAP
SCALE: 1"=1000'

Client Sample ID:		GWQS	AB-4D	PER-2	PER-2D	PER-3	PER-3D	PER-9	PER-9D	PER-9DD	PER-10	PER-10D
GC/MS Volatiles (SW846 8260C)												
Benzene	ug/l	1	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	**2**
Bromodichloromethane	ug/l	1	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	**1.5**	ND (0.23)	ND (0.23)
1,2-Dibromoethane	ug/l	0.03	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	**0.25 J**	ND (0.23)	ND (0.23)
Methyl Tert Butyl Ether	ug/l	70	2.9	ND (0.24)	**693**	ND (0.24)	**77**	ND (0.24)	7.5	0.31 J	ND (0.24)	25.7
Tert Butyl Alcohol	ug/l	100	23	ND (2.8)	**204**	ND (2.8)	45.8	ND (2.8)	23.1	ND (2.8)	ND (2.8)	35
GC/MS Semi-volatiles (SW846 8270D)												
Benzo(a)anthracene	ug/l	0.1	-	-	-	-	-	-	-	-	-	-
1,4-Dioxane	ug/l	0.4	**3.4**	ND (0.72)	ND (0.75)	ND (0.72)	ND (0.72)	ND (0.72)	ND (0.72)	ND (0.74)	ND (0.72)	**4.3**
bis(2-Ethylhexyl)phthalate	ug/l	3	ND (0.55)	2	ND (0.58)	ND (0.55)	ND (0.55)	ND (0.55)	**3.5**	ND (0.57)	ND (0.55)	ND (0.55)
Metals Analysis												
Aluminum	ug/l	200	**1290**	**632**	<200	<200	<200	**2610**	<200	<200	<200	<200
Arsenic	ug/l	3	**13.5**	<3.0	<3.0	<6.0 [h]	<3.0	**5.6**	<3.0	<3.0	**4.7**	<3.0
Iron	ug/l	300	**2090**	**2460**	<100	**1010**	131	**5550**	185	**896**	**2040**	123
Lead	ug/l	5	<30 [i]	**5.5**	<3.0	<6.0 [h]	<3.0	3.3	<3.0	<3.0	<3.0	<3.0
Manganese	ug/l	50	21.4	**120**	29.4	**253**	**194**	**70.8**	48.5	**63.6**	**98.3**	**656**
Sodium	ug/l	50000	**2230000**	29600	**69800**	**1540000**	**1110000**	**198000**	**227000**	**126000**	**160000**	**1320000**
General Chemistry												
Nitrogen, Ammonia	mg/l	3	**6.1**	0.56	<0.20	0.22	**8.1**	<0.20	0.88	<0.20	0.94	**18.7**

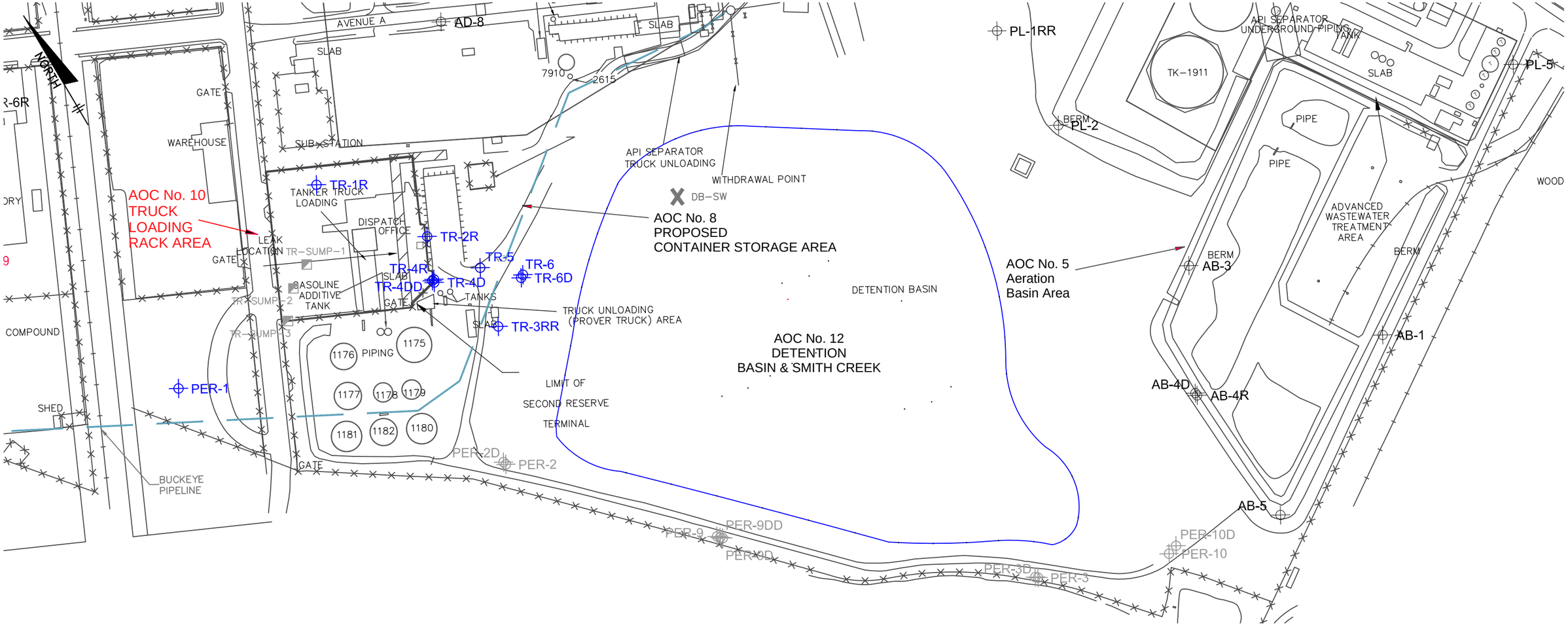
0 150 300
(SCALE IN FEET)

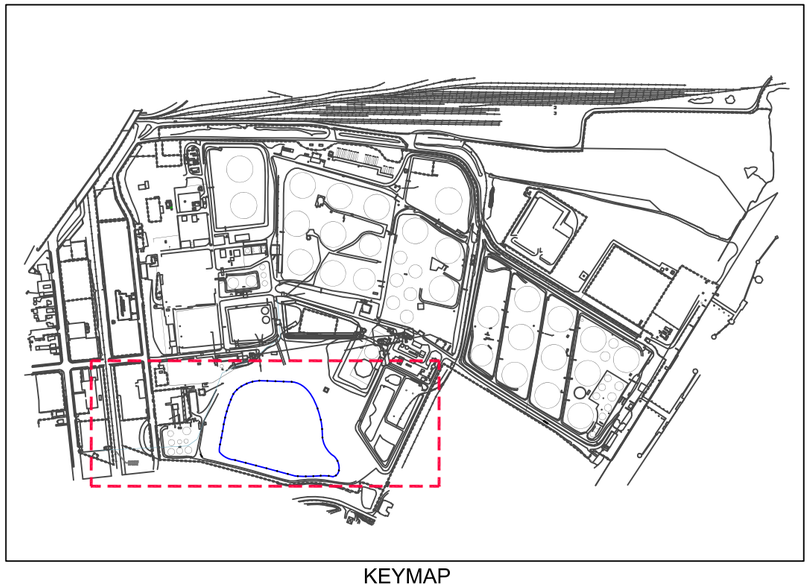
November 2015 Annual Groundwater
Sampling Results
Detention Basin & Smith Creek - AOC 12
& AB-4D - AOC 5

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 5d





KEYMAP

SCALE: 1"=1000'

Client Sample ID:		GWQS	TR-1R	TR-2R	TR-3RR	TR-4R	TR-4D	TR-4DD	TR-5	TR-6	TR-6D	PER-1
GC/MS Volatiles												
Benzene	ug/l	1	ND	**204**	**13.2**	**42.2**	**5.8 J**	ND	**4490**	**179**	0.40 J	ND
1,2-Dichloroethane	ug/l	2	ND	**5.8**	ND	ND	ND	ND	ND	ND	0.54 J	ND
1,1-Dichloroethene	ug/l	1	**2.1**	ND	ND	ND	ND	**2.7**	ND	ND	**2.8**	ND
1,2-Dichloropropane	ug/l	1	ND	ND	ND	ND	ND	ND	ND	ND	**1.4**	ND
Methyl Tert Butyl Ether	ug/l	70	ND	**487**	**765**	9.3	**6010**	4.9	**1200**	**1270**	11.1	ND
Tert Butyl Alcohol	ug/l	100	ND	**263**	**2820**	ND	**64700**	16.7	**3850**	**575**	25.8	ND
Tetrachloroethene	ug/l	1	ND	ND	ND	ND	ND	ND	ND	ND	**3.8**	ND
Trichloroethene	ug/l	1	ND	ND	ND	ND	ND	**2.9**	ND	ND	**1.8**	ND

0 150 300

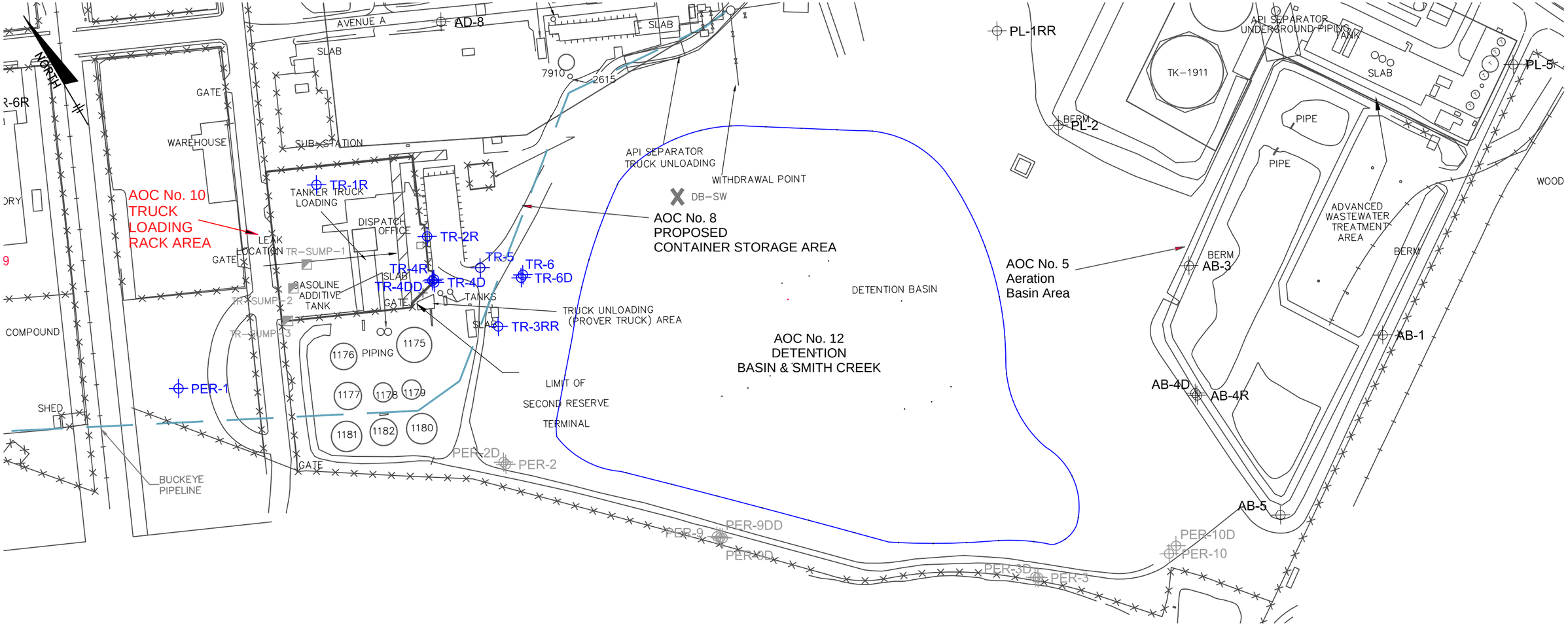
(SCALE IN FEET)

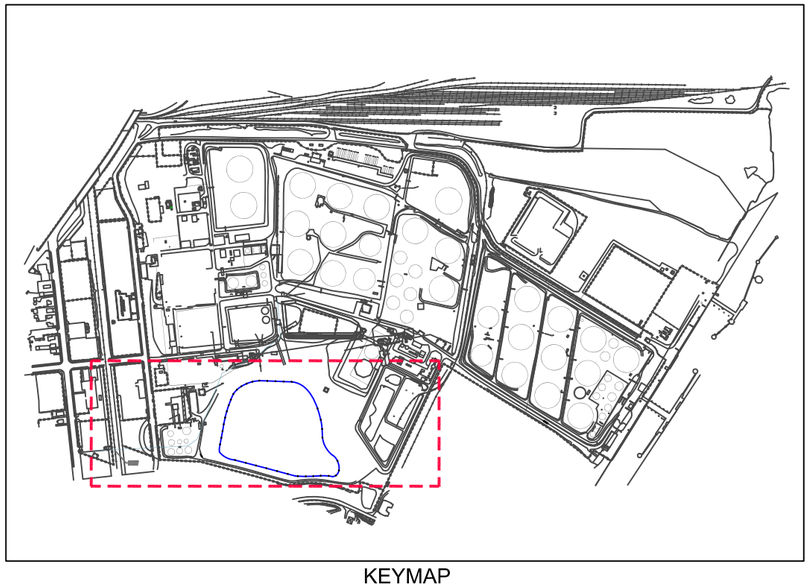
November 2016 Annual Groundwater
Sampling Results
Truck Loading Rack - AOC 10 (VOCs)

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 6a





KEYMAP
SCALE: 1"=1000'

Client Sample ID:		GWQS	TR-1R	TR-2R	TR-3RR	TR-4R	TR-4D	TR-4DD	TR-5	TR-6	TR-6D	PER-1
GC/MS Semi-volatiles												
bis(2-Ethylhexyl)phthalate	ug/l	3	ND	ND	ND	**4**	**4.6**	**30.3**	ND	ND	ND	ND
2-Methylnaphthalene	ug/l	30	ND	20	ND	**111**	ND	ND	3	ND	ND	ND
Benzo(a)anthracene	ug/l	0.1	ND	**1.1**	ND	ND	ND	**0.202**	ND	ND	ND	**0.11**
Benzo(a)pyrene	ug/l	0.1	ND	**0.282**	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	ug/l	0.2	ND	**0.36**	ND	ND	ND	0.114	ND	ND	ND	ND
1,4-Dioxane	ug/l	0.4	0.387	ND	ND	ND	**1.49**	**0.657**	ND	ND	**0.941**	ND

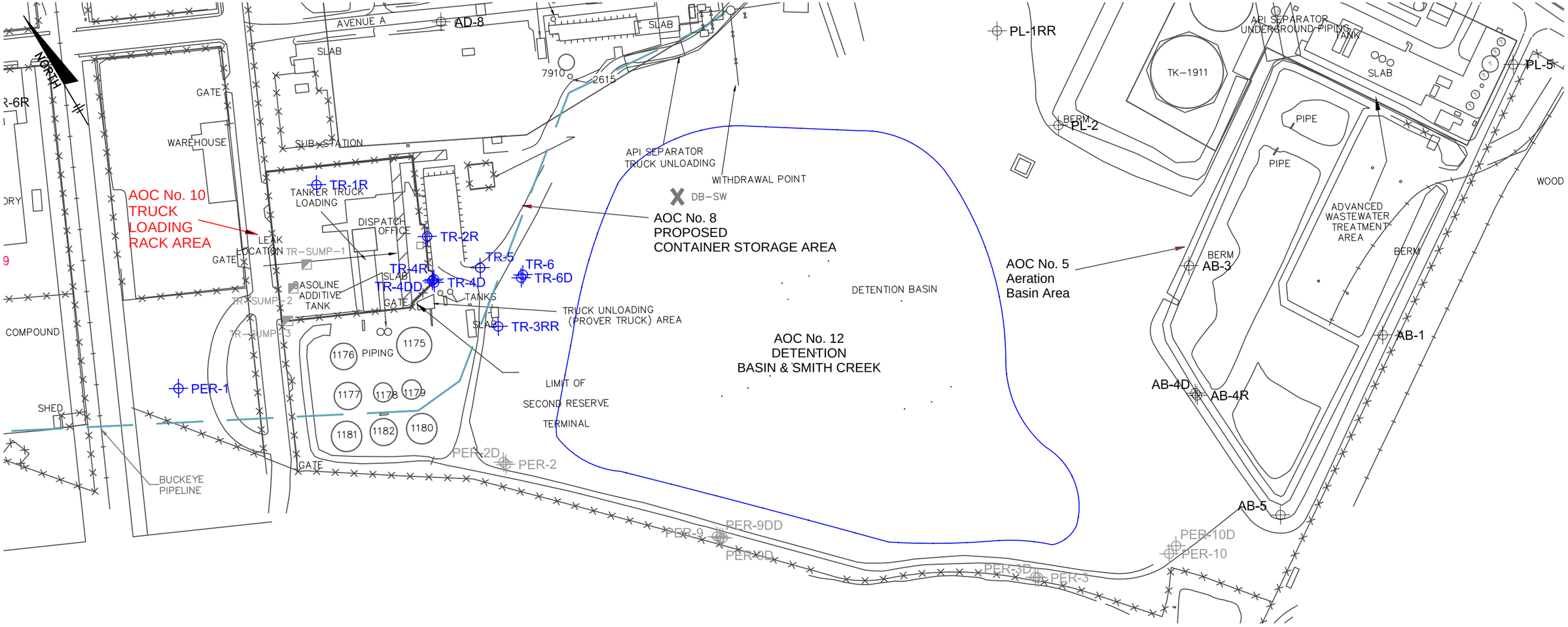
0 150 300
(SCALE IN FEET)

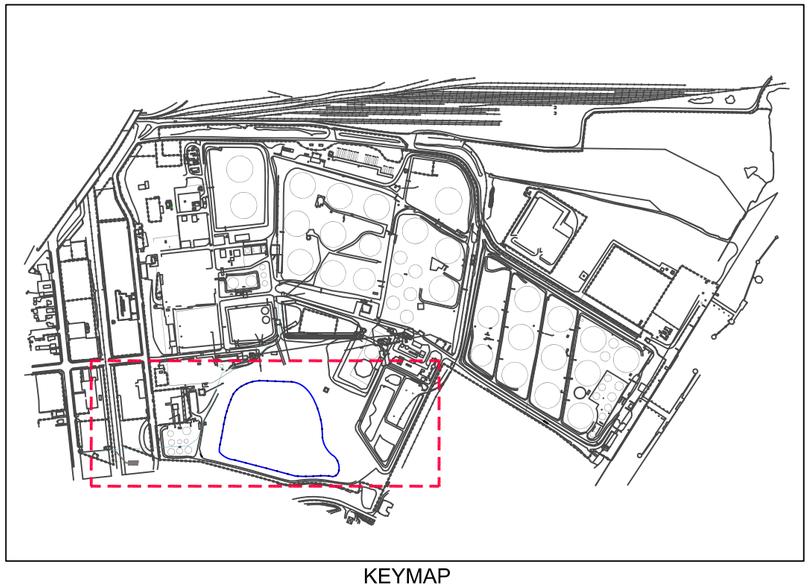
November 2016 Annual Groundwater
Sampling Results
Truck Loading Rack - AOC 10 (SVOCs)

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 6b





KEYMAP

SCALE: 1"=1000'

Client Sample ID:		GWQS	TR-1R	TR-2R	TR-3RR	TR-4R	TR-4D	TR-4DD	TR-5	TR-6	TR-6D	PER-1
Metals Analysis												
Aluminum	ug/l	200	**423**	**371**	**1090**	**304**	**210**	**1030**	**2640**	**664**	**476**	**9510**
Antimony	ug/l	6	<6.0	**12.2**	<6.0	<6.0	<6.0	<6.0	**7.4**	**8.8**	<6.0	<12
Arsenic	ug/l	3	<3.0	**7.1**	**3.8**	**14.1**	<3.0	**3.7**	**12.9**	**11.7**	<3.0	**7.8**
Cadmium	ug/l	4	<3.0	<3.0	<3.0	<3.0	3	**4.4**	<3.0	<3.0	<3.0	<6.0
Iron	ug/l	300	**689**	**414**	**1340**	**771**	108	**3930**	**6220**	**1440**	**354**	**9890**
Lead	ug/l	5	<3.0	<3.0	4	<3.0	<3.0	**5.2**	**7.6**	<3.0	<3.0	**35.8**
Manganese	ug/l	50	**51.2**	**94.2**	**755**	22	**582**	**148**	**2250**	**469**	<15	**3120**
Sodium	ug/l	50,000	42,400	**82,700**	18,700	**202,000**	**120,000**	**54,900**	**354,000**	11,600	**59,100**	<20,000
General Chemistry												
Nitrogen, Ammonia	mg/l	3	<0.20	1.2	<0.20	1.2	0.34	<0.20	1.3	<0.20	<0.20	<0.20

0 150 300

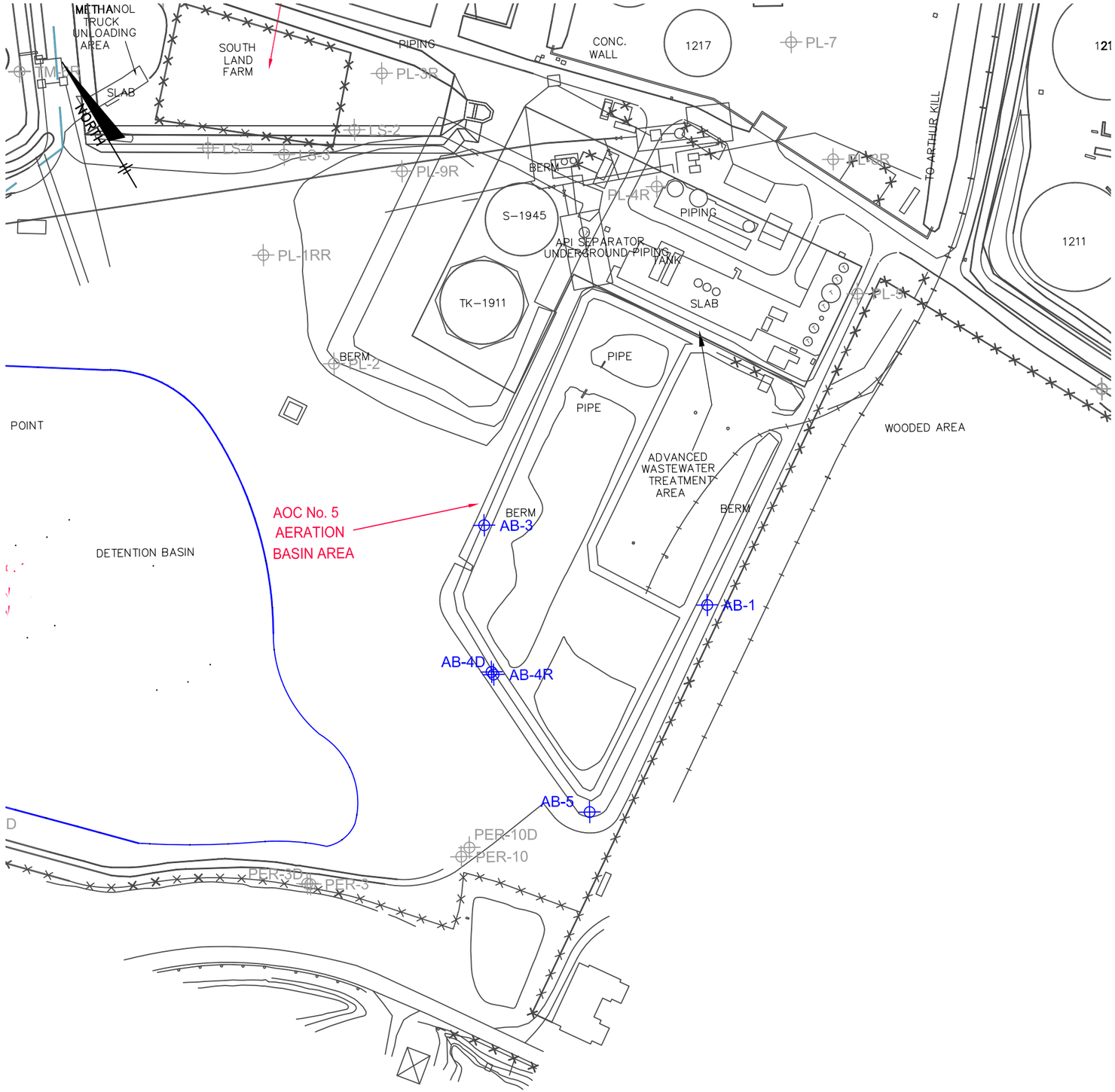
(SCALE IN FEET)

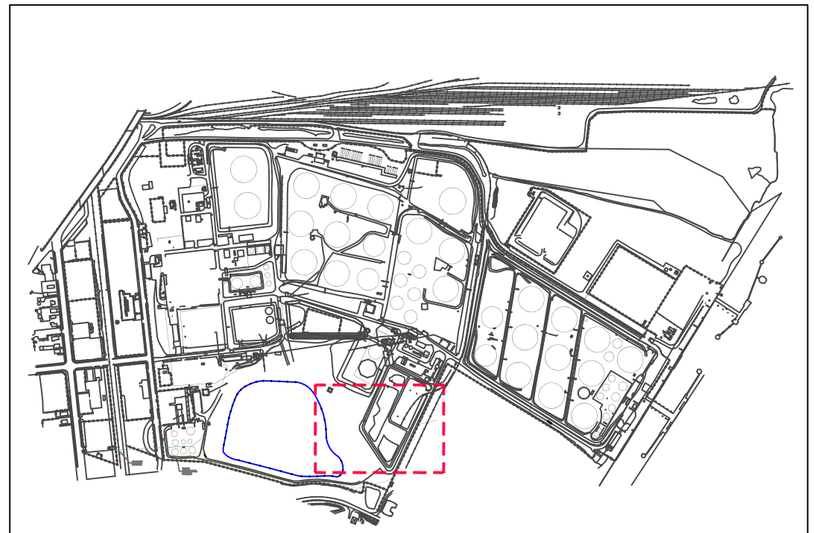
November 2016 Annual Groundwater
Sampling Results
Truck Loading Rack - AOC 10 (Metals/Gen Chemistry)

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 6c





KEYMAP

SCALE: 1"=1000'

Client Sample ID:		GWQS	AB-1	AB-3	AB-4R	AB-4D	AB-5
GC/MS Volatiles							
VOCs	ug/l	-	<GWQS	<GWQS	<GWQS	<GWQS	<GWQS
GC/MS Semi-volatiles							
Benzo(a)anthracene	ug/l	0.1	ND	**0.119**	ND	ND	ND
1,4-Dioxane	ug/l	0.4	ND	ND	ND	**3.91**	ND
Metals Analysis							
Aluminum	ug/l	200	**4240**	**57000**	**511**	**746**	**227**
Antimony	ug/l	6	<6.0	<30	**13.1**	<6.0	<6.0
Arsenic	ug/l	3	**33.5**	**50.5**	**12.6**	**11.1**	<3.0
Chromium	ug/l	70	<10	**131**	<10	<10	<10
Iron	ug/l	300	**5,720**	**66,400**	**1,440**	**1160**	**568**
Lead	ug/l	5	**6.6**	**51.5**	<3.0	<15	<3.0
Manganese	ug/l	50	**65**	**135**	**85.8**	<15	<15
Sodium	ug/l	50,000	11,900	**82,700**	**1,270,000**	**3,230,000**	<10000
General Chemistry							
Nitrogen, Ammonia	mg/l	3	<0.20	0.3	**9.5**	**12.4**	<0.20

0 150 300

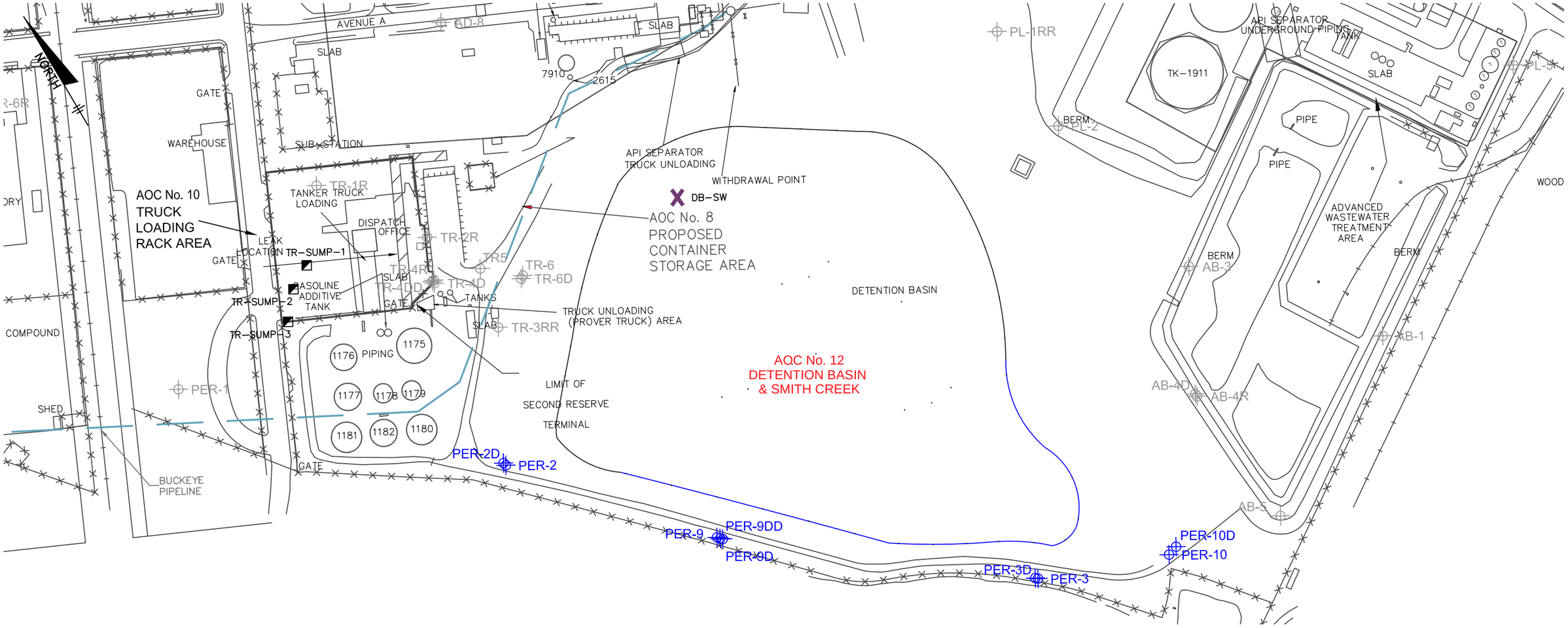
(SCALE IN FEET)

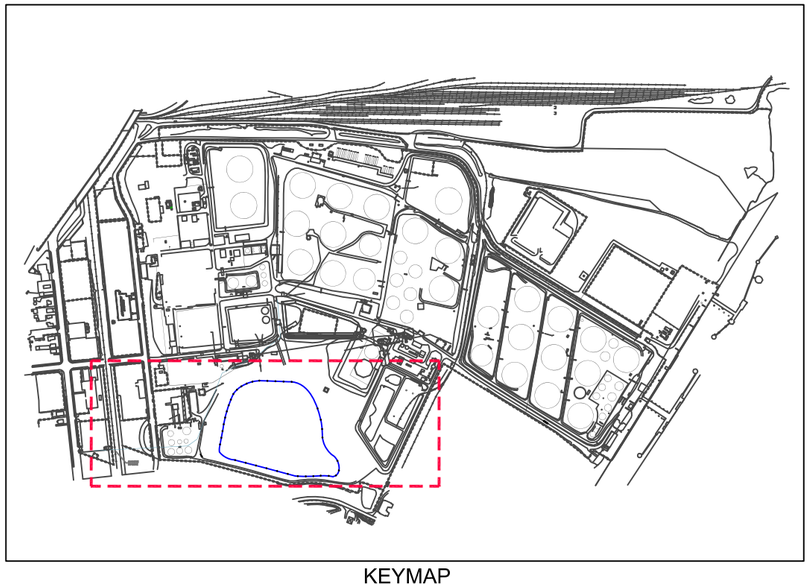
November 2016 Annual Groundwater Sampling Results
Aeration Basins - AOC 5

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 6d





KEYMAP
SCALE: 1"=1000'

Client Sample ID:		GWQS	PER-2	PER-2D	PER-3	PER-3D	PER-9	PER-9D	PER-9DD	PER-10	PER-10D
GC/MS Volatiles											
Methyl Tert Butyl Ether	ug/l	70	17.5	**880**	ND	**110**	ND	30.8	8.9	6.5	ND
Tert Butyl Alcohol	ug/l	100	19.1	**720**	ND	**141**	ND	**324**	50.1	22.9	4.5 J
GC/MS Semi-volatiles											
1,4-Dioxane	ug/l	0.4	ND	**0.746**	ND	**0.523**	ND	**0.519**	ND	**3.79**	ND
Metals Analysis											
Aluminum	ug/l	200	**378**	<200	<200	<200	**1920**	<200	<200	<200	**559**
Arsenic	ug/l	3	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3	**5.9**
Iron	ug/l	300	**800**	<100	**508**	285	**3320**	<100	**61300**	<100	**4030**
Lead	ug/l	5	**5.5**	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Manganese	ug/l	50	42.5	**59.7**	**162**	**221**	**70.5**	**89.9**	**1490**	**171**	**235**
Sodium	ug/l	50,000	35,200	**57,200**	**1,040,000**	**1,090,000**	41,300	**269,000**	**391,000**	**1,170,000**	**162,000**
General Chemistry											
Nitrogen, Ammonia	mg/l	3	0.39	<0.20	0.57	**15.6**	<0.20	**3.5**	0.41	**31**	2.5

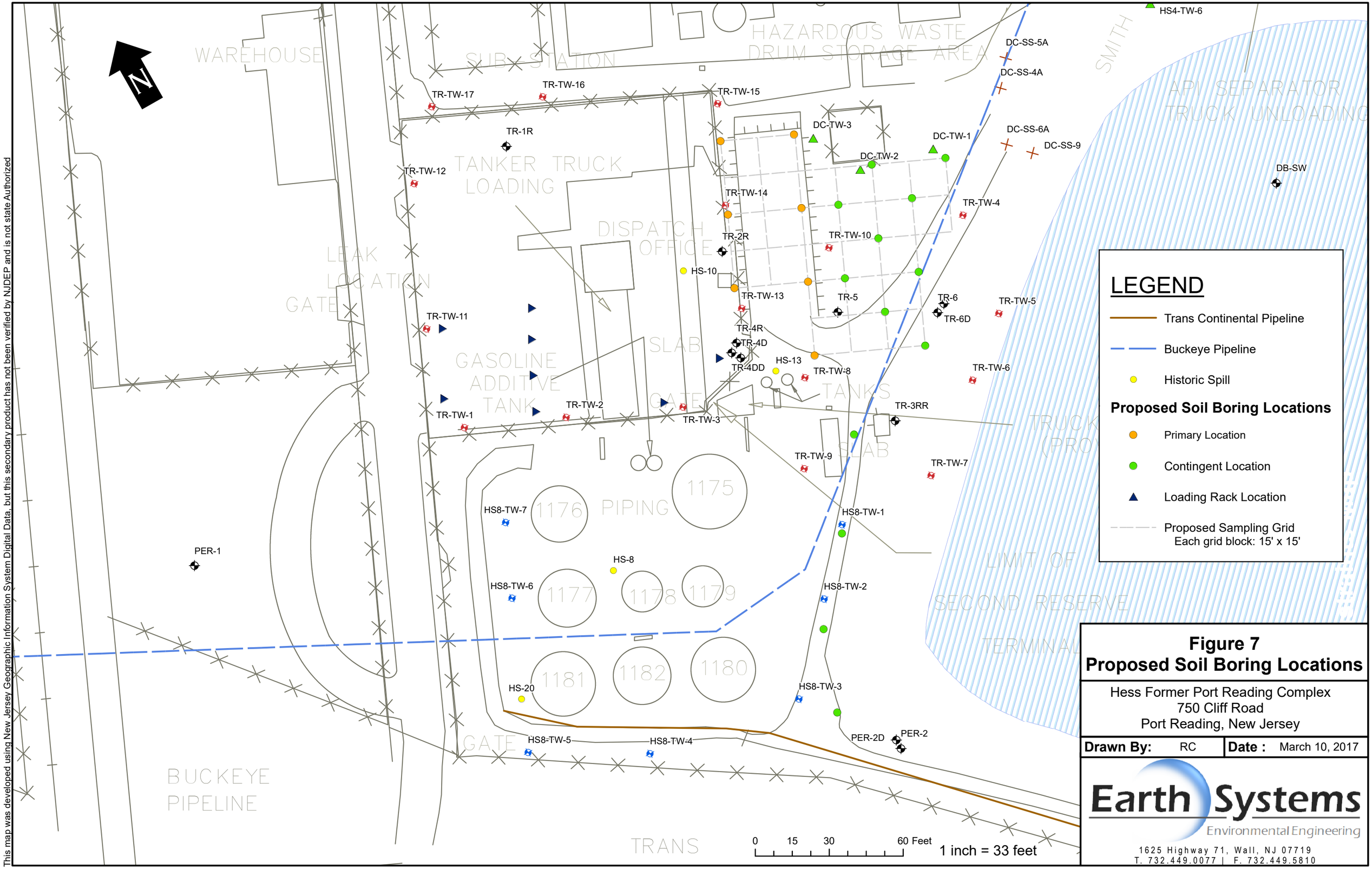
0 150 300
(SCALE IN FEET)

November 2016 Annual Groundwater
Sampling Results
Detention Basin & Smith Creek - AOC 12

HESS CORPORATION
FORMER PORT READING COMPLEX (HC-PR)
750 CLIFF ROAD
PORT READING, NEW JERSEY

Earth Systems

Figure 6e



LEGEND

- Trans Continental Pipeline
- Buckeye Pipeline
- Historic Spill

Proposed Soil Boring Locations

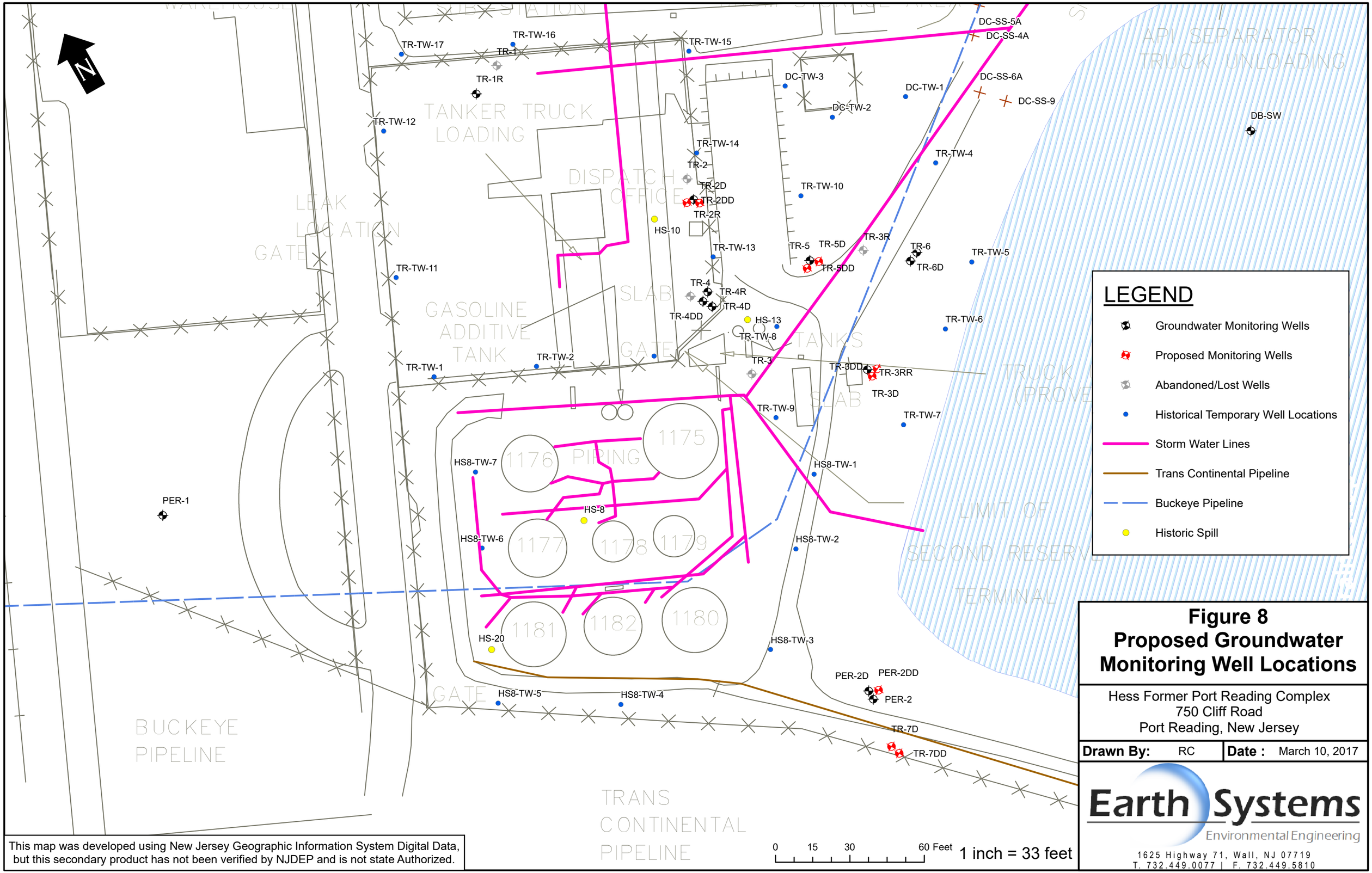
- Primary Location
- Contingent Location
- Loading Rack Location
- Proposed Sampling Grid
  Each grid block: 15' x 15'

Figure 7
Proposed Soil Boring Locations

Hess Former Port Reading Complex
750 Cliff Road
Port Reading, New Jersey

Drawn By: RC **Date :** March 10, 2017

Earth Systems
Environmental Engineering
1625 Highway 71, Wall, NJ 07719
T. 732.449.0077 | F. 732.449.5810



LEGEND

- Groundwater Monitoring Wells
- Proposed Monitoring Wells
- Abandoned/Lost Wells
- Historical Temporary Well Locations
- Storm Water Lines
- Trans Continental Pipeline
- Buckeye Pipeline
- Historic Spill

This map was developed using New Jersey Geographic Information System Digital Data, but this secondary product has not been verified by NJDEP and is not state Authorized.

Figure 8
Proposed Groundwater Monitoring Well Locations

Hess Former Port Reading Complex
750 Cliff Road
Port Reading, New Jersey

Drawn By:	RC	**Date :**	March 10, 2017

Earth Systems
Environmental Engineering
1625 Highway 71, Wall, NJ 07719
T. 732.449.0077 | F. 732.449.5810